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The dates at which these separate papers are published are recorded in the table of contents of each of the volumes.

The present volume is the seventy-fourth of this series.

The *Bulletin*, the first of which was issued in 1875, consists of a series of separate publications comprising monographs of large zoological groups and other general systematic treatises (occasionally in several volumes), faunal works, reports of expeditions, catalogues of type-specimens, special collections, and other material of similar nature. The majority of the volumes are octavo in size, but a quarto size has been adopted in a few instances in which large plates were regarded as indispensable. In the *Bulletin* series appear volumes under the heading *Contributions from the United States National Herbarium*, in octavo form, published by the National Museum since 1902, which contain papers relating to the botanical collections of the Museum.

ALEXANDER WETMORE,
Assistant Secretary, Smithsonian Institution.

WASHINGTON, D. C., November 15, 1929.

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NEW DIPTERA OR TWO-WINGED FLIES FROM SOUTH AMERICA

By J. M. ALDRICH

Associate Curator, Division of Insects, United States National Museum

The following paper contains descriptions of 20 new species and 4 new genera of Diptera from South America. The types of all the species, except that of *Daetaleus purpureus*, are in the United States National Museum.

As the paper was going through the press it became possible to include as paratypes some material collected in Chile and Argentina by Edwards and Shannon. I hope to take up the bulk of their muscoid collections in a later paper.

Family STRATIOMYIIDAE

Genus ODONTOMYIA Meigen

Odontomyia MEIGEN, Illiger's Mag., vol. 2, 1803, p. 265.

ODONTOMYIA TREMOLERANA, new species

One of the largest species (male 15 mm., female 16 mm.); thorax green throughout except for three dorsal black stripes, which in the males join together just before the scutellum; the central stripe is greatly widened in front. Between the front and middle coxae, along the median line is an oblong area which is reddish yellow. Abdomen green with a dorsal narrow, sharply defined black median stripe on second and third segments, spreading vaguely out over the fourth and fifth; in the female the abdomen is very broad and there is a distinct trace of a brown stripe on each side halfway between the middle and the margin. Coxae and femora green; tibiae and tarsi reddish.

Head of male green below and behind, rather strongly carinate below the antennae; labella large, black; eyes bare, hardly contiguous, with an area of small facets occupying the lower fourth. First two antennal joints reddish, short, of equal length, third joint broken off.

The female has small eyes, as usual, the front green with a roundish black spot covering the ocelli, and a black band from eye to eye

passing just above base of antennae, the color deepest in the middle and close to eye.

Wings hyaline, the costal margin yellow; third vein forked at tip; three veins from discal cell which curve forward and become evanescent.

Described from two males taken at Menafrá, Rio Negro, Uruguay, December 15, 1914; and one female from Montevideo; all received from Juan Tremoleras, to whom the male paratype has been returned.

Type.—Female, Cat. No. 29367, U.S.N.M.

The nearest related described species appear to be *Odontomyia quadrilineata* Macquart¹ and *O. histrio* Walker.² Both are large species like this; the former, however, has a black band across the middle of the front in the female, and the latter has a spot on each side marking the beginning of the band; in both the description of the abdomen fails to indicate such a narrow black median stripe as in the present species.

Family CYRTIDAE

Genus OCNAEA Erichson

— *Ocnaea* ERICHSON, Entomographien, 1840, p. 155.—COLE, Trans. Amer. Ent. Soc., vol. 45, 1919, p. 23, definition and key to North American species.

The genus includes 13 known species, all American and mostly tropical; four, however, occur in the southwestern part of the United States, namely, *coerulea*, *helluo*, and *loewi* in Texas, and *flavipilosa* in Arizona. The two species here described are from Ecuador, and among the largest of the genus, the specimens measuring from 12 to 17 mm. in length. Only *calida* and *grossa* approach this size, and the latter, having bare eyes, is probably better placed in *Apelleia* Bellardi.

OCNAEA GIGAS, new species

Male.—Chestnut brown, second abdominal segment lighter, third to sixth segments above except at sides much darker in two of the three specimens, blackish with slight bluish tinge; venter with the broad sternites variably infuscated; thoracic dorsum subshining, with or without a pair of lighter submedian lines diverging forward; femora and tibiae black, the tarsi brown. Antennae blackish, inserted just in front of the large posterior ocelli (the front ocellus absent), basal joints large, third long, sickle shaped, slender and curved downward, reaching below the head, without hairs on any part. It is twice as long as in *tumens*, figured by Walker. The

¹ Hist. Nat. Dipt., vol. I, 1834, p. 248, locality South America.

² Dipt. Saund., 1851, p. 77, locality Brazil.

compound eyes literally cover the whole head except the flattened hind surface and a triangle above where the ocelli and antennae are situated. The two posterior ocelli are large and prominent, a transverse groove just anterior to them. Pile of eyes dense, dark in front, more pale yellow at sides. Proboscis visible but minute. Mesonotum covered with dense glistening pale yellow pile, the ground color mostly dark yellow with or without faint lighter stripes. Hind calypters translucent brownish yellow with well-defined brown rim and yellow fringe. Pile of abdomen yellow, much less conspicuous than on mesonotum. Wing small, tinged with yellow; the second and third veins fork just before the anterior crossvein, which is at the extreme base of the discal cell; an extra crossvein in the first posterior cell just beyond tip of discal, the second section of the first posterior closed and petiolate; all of the veins reach the margin; fourth posterior closed and with comparatively long petiole which is sometimes equal to the vein forming the apical boundary of the cell.

Length, 13 to 17 mm.

Described from three males collected at Mera, Ecuador, in February, 1923, by F. X. Williams; they were received from the Hawaiian Sugar Planters' Association, to which one paratype is returned. One specimen has notably paler thorax and abdomen than the others, having no distinct darker abdominal marking.

Type.—Male, Cat. No. 40987, U.S.N.M.

OCNAEA FALCIFER, new species

Male.—Head, thorax, legs, and abdomen black or brown, the second abdominal segment yellow on apical half or more, sides of second, third, and fourth, and posterior bands on the sternites also yellow; third antennal joint brownish yellow, long, slender, and sickle shaped as in *gigas*, but lighter in color; eyes with dense, long black pile; thorax with dense blackish pile, which has a reddish tinge when viewed from in front. Hind calypter deep brown, with black border and brown fringe. Legs black, the tarsi a little lighter. Wings small, with yellow tinge; venation as in *gigas*, but the second section of the first posterior cell is wide open in one specimen, narrowly closed in the other, and the fourth posterior cell is closed near margin in three of the four wings, wide open in the other. This open fourth cell is on the other fly from the open first.

Length, 12 to 14.7 mm.

Described from two males, collected with the specimens of *gigas*. The paratype is returned to the Hawaiian Sugar Planters' Association.

Type.—Male, Cat. No. 40988, U.S.N.M.

This species is so much like *gigas* in nearly all structural details that I have considered the possibility that one is a color form of the other. It is apparent that the color and venation are variable, but the differences seem to be sufficient to make the species valid.

Family ANTHOMYIIDAE

Genus OPHYRA Robineau-Desvoidy

Ophyra ROBINEAU-DESVOIDY, Myodaires, 1830, p. 516.—RONDANI, Dipt. Ital. Prod., vol. 6, 1877, p. 34.—VAN DER WULP, Biologia, Dipt., vol. 2, 1896, p. 323.—STEIN, Archiv Naturgesch., vol. 83, 1917 (1919), p. 130.—SEGUY, Anthomyides de France, 1923, p. 277.—MALLOCH, Ann. Mag. Nat. Hist., vol. 11, 1923, p. 664.

Before describing a new species from Chile, I will notice the species already known from South America. All the extra-European species are listed by Stein in the article just cited by him.

OPHYRA AENESCENS Wiedemann

Anthomyia aenescens WIEDEMANN, Auss. Zweifl., vol. 2, 1830, p. 435.
Ophyra argentina BIGOT, Annales, 1885, p. 302.—GIGLIO-TOS, Ditt. del Mess., vol. 4, 1895, p. 26.—VAN DER WULP, Biologia, Dipt., vol. 2, 1896, p. 323.
Ophyra aenescens, STEIN, Berlin Ent. Zeitschr., vol. 42, 1897, p. 170; Ann. Mus. Nat. Hung., vol. 2, 1904, p. 451, and vol. 16, 1918, p. 234; Arch. Naturgesch. vol. 76, 1911, p. 100, and vol. 84, 1918 (1920), p. 42; Zeitschr. Hym. Dipt., vol. 7, 1907, p. 212.—BISHOPP and LAAKE, Journ. Agric. Research, vol. 21, 1921, p. 729.

Ophyra carbonaria SHANNON and DEL PONTE, Rev. Inst. Bacteriologico, Buenos Aires, vol. 4, No. 5, 1926 (1927), pp. 20, 30.

This species may be distinguished from the others by having yellow palpi and black knobs on the halteres; it has a bronze tinge. It has been reported from Northern Chile by Stein, 1911 (Caldera, Antofagasta, Arica), and is known from Argentina, Brazil, Peru, etc., north to the southern part of the United States. *O. carbonaria* was recently described from Argentina. Bishopp and Laake, 1921, report that in their experiments they found the adult to fly more than four miles at the maximum from a point of liberation. I have received no Chilean specimens of this species.

OPHYRA SETIA Walker

Anthomyia setia WALKER, List Dipt. Ins., vol. 4, 1849, p. 956.
Ophyra setia STEIN, Zeitschr. Hym. Dipt., vol. 1, 1901, p. 208.

This was described from a single female, collected by Darwin in the Galapagos Islands. Stein on examining the type in the British Museum reported that it is very like *O. aenescens* except in having yellowish halteres. No other specimens have been reported, and the male is unknown. However, the United States National Museum has four males from the Galapagos Islands of undoubted *O. aenescens*,

the knobs of the halteres being brown. It may be doubted whether *O. setia* is specifically distinct from *O. aenescens*.

OPHYRA VIRESCENS Macquart

Ophyra virescens MACQUART, Dipt. Exot., vol. 2, part 3, 1843, p. 321 (sep. p. 164).

Briefly described from a female taken at Guaratuba, Brazil. The type is probably no longer in existence, and the identity of the species is very uncertain. The characters mentioned are: shining green; face with whitish pollen; antennae and legs black; calypters pale yellow; length 6 millimeters. Macquart also says, "thorax a bandes noirs," which as I understand his terms may mean either black longitudinal stripes or transverse bands on the thorax. If this character is well developed, in either sense, it ought to make the species recognizable. So far it remains unrecognized.

OPHYRA CUTILIA Walker

Anthomyia cutilia WALKER, List. Dipt. Ins., vol. 4, 1849, p. 954.

Ophyra cutilia STEIN, Zeitschr. Hym. Dipt., vol. 1, 1901, p. 194.

Described from Montevideo, only the female being known. Stein has added a few characters from his examination of the type. The most prominent feature is the blackish calypters. I have a male which I identify as this species, as the calypters are the same, and the deep blue color of the female occurs in this male overlaid with such pruinescence as usually distinguishes the sex in this genus.

Color dark blue; the head, pleurae, legs, antennae, and palpi are black; calypters brown, the hind one with blackish rim and long brown fringe. Wings uniformly infuscated.

Male.—Front very narrow, not much wider than front ocellus, still the linear shining parafrontals are separated by a slender median stripe. Lunule silvery, lower parafrontal shining black, quite narrow; the parafacial with brown pollen beginning at about the tip of the second antennal joint. Cheek about one-seventh of the eyeheight. Frontal bristles beginning below the middle of the space between ocelli and lunule; antennae dark brown, the arista distinctly pubescent on basal third, slightly thickened at base, hind edge of eye scarcely at all emarginate in side view. Hairs of back of head all black.

Thorax almost black, subopaque; acrostichals 1,1 (anterior small); dorsocentrals 2, 4; intraalar 2, supraalar 1 (no prealar); presutural 1; sternopleura with a small bristle anteriorly and one large one behind, acrostichal hairs in about four rows. Hind calypter long and with unusually heavy fringe. Halteres yellow with blackish knob.

Abdomen with rather dense and erect hair, rather flat toward the base with thin brownish pollen when viewed from behind on which is the beginning of a median dark line. Front tibia without outer flexor bristle, middle tibia with two bristles behind, the upper at the middle, hind tibia with a very distinct calcar below the middle, and on the outer flexor side two bristles below the middle. Middle femur with about a dozen truncated bristles on the under side near base, on the hind side with a dense slanting row of small bristles extending the whole length. Hind femur on the outer side with a distinct row of bristles the whole length, becoming more dorsal toward the tip, also two or three stubby truncate bristles near base on under side and a partial row of bristles on the outer flexor side beyond middle. Claws and pulvilli short. Wings rather narrow, evenly infuscated.

Length, 6.4 mm.

Described from one male, Sao Paulo, Brazil, Dr. A. Lutz.

OPHYRA VILLOSA, new species

Shining blue green with black legs, antennae and palpi. Wings hyaline. Calypters white. Hind tibia with long villosity.

Male.—Front nearly as wide as ocellar triangle, the shining black distinctly punctured parafrontals separated by the median stripe which at narrowest is as wide as one parafrontal. The frontal bristles begin just above the middle of the space between the ocelli and lunule, the latter silvery, very conspicuous. Parafacials narrow with dull gray pollen which extends across the face. Cheek about one-tenth the eyeheight. Hind edge of eye distinctly emarginate along the middle. Mesonotum with rather dense erect hairs, entirely shining. Before the suture there are about four rows of delicate rather long acrostichal hairs, but the remaining surface is so hairy that they are difficult to distinguish. Dorsocentral bristles more or less hair-like except the hindmost pair. Anterior sternopleural very minute or absent, the calypters white with white rim and fringe, the hind one projecting considerably but not so long as in *O. cutilia*. Halteres black the stem yellow toward base.

Abdomen wholly shining with long erect pile except in the middle of the dorsum. Legs black, claws and pulvilli not elongated; front tibia without a bristle on the outer flexor side. Middle tibia with two bristles on hind side. Hind tibia with long, erect, but not dense villous hairs or bristles in two rows on the outer and inner flexor sides, the intervening space with few hairs. Wings hyaline, third and fourth veins very slightly convergent.

Length, 4.2 to 4.6 mm.

Described from two males, collected at Perales, Chile, February 1925, by Father Anastasio Pirion, received from Alfredo Faz, who has retained some additional specimens.

Type.—Male, Cat. No. 28897, U. S. N. M.

Genus **HYDROTAEA** Robineau-Desvoidy

Hydrotaea ROBINEAU-Desvoidy, Myodaires, 1830, p. 509.

HYDROTAEA FUSCISQUAMA, new species

Deep black, including palpi, antennae and legs; closely allied to *H. dentipes* Fabricius, but having infuscated calypters with black rim and fringe, and the abdomen with light blue pruinosity.

Male.—Front including parafrontals black, about as wide in middle as the ocellar triangle; parafacials silvery from the antennal insertion down, becoming brown on lower part; lunule small, golden. Two or three upturned bristles on the cheek next to the vibrissae.

Thorax rather shining black, only when viewed directly from behind is there is trace of brown pruinose stripes anteriorly. Acrostichal 3,5; dorsocentral 2,4; humeral 3; posthumeral 1; presutural 1; notopleural 2; supraalar 3 (small except middle one); intraalar 3; postalar 2; sternopleural 1,1 (some posterior large hairs almost like bristles). Halteres black. Calypters, as noted above, the posterior projecting far beyond anterior.

Abdomen with striking light blue color on black ground, only a trace of median dark stripe. The blue pruinosity extends on venter to the membrane, and even on the sternal plates.

Legs shining black, pulvilli white and not enlarged. Front femur with the usual two thorns below near tip; on the outer flexor side below near base are five long bristles, on the inner side just before the thorn is a row of about six short depressed spines. Front tibia irregularly flattened and concave on flexor side, on outer flexor side near tip with elongated brush-like series of erect hairs. Middle femur with two rows of bristles on front side of basal half, the lower long; a uniform row of small slanting bristles on hind side, and on lower hind side a row of long straight spines on basal half. Middle tibia with rather dense, short, suberect hairs on whole length of front side, on hind side two bristles near middle. Hind tibia straight, not provided with a keel-like brush of short hairs on flexor side at apex, but with a long calcar below middle and on outer side a fairly regular row of cilia.

Wings distinctly brown, the fourth vein converging toward third precisely as in *H. dentipes*.

Female.—Front with the usual cruciate bristles. Parafacials colored as in the male, but a little wider. Thorax as in male. Abdo-

men ovate but colored as in male. Legs plain as in female *H. dentipes*. Wings and calypters less infuscated than in male, but the latter with dark rim and fringe.

Length, male 6.3 mm., female the same.

Described from one male and one female, collected at Perales, Quilpue, Chile, by Father Anastasio Pirion, on January 25. Received from Alfredo Faz, who has other specimens not seen by me.

Type.—Male, Cat. No. 28876, U.S.N.M.

Family SARCOPHAGIDAE

Genus OPSIDIA Coquillett

Opsidia COQUILLETT, Journ. New York Ent. Soc., vol. 3, 1895, p. 102.—

ALLEN, Proc. U. S. Nat. Mus., vol. 68, art. 9, 1926, p. 41.

OPSIDIA INTONSA, new species

Male.—Front narrowest on the lower part where it measures half the head width, the eyes approximate each other still more across the face. Head covered with dark plumbeous pollen and unusually hairy and bristly; frontal stripe almost the same color as the parafrontal, the latter with a somewhat double row of bristles and two proclinate orbitals; parafacials broad with numerous coarse hairs and a diagonal row of bristles above the transverse impression. Front margin of the head in profile is shorter and more vertical than in *O. gonioides*, genotype of *Opsidia*, and the third antennal joint is much shorter. Antennae black, the base somewhat reddish, the third joint less than three times the second; arista rather short, the penultimate joint not elongated; antennal depression quite deep, ending, however, a little above the mouth; vibrissae not well developed; palpi brown, of ordinary structure; proboscis slender at base, the tip broken off.

Thorax blackish with a little thin pollen forming more distinct cinereous spots on the humeri, postalar declivity and margin of scutellum. Anterior acrostichal 3, posterior numerous and hairlike. Pleurae shining black.

Abdomen subshining black with thin whitish pruinosity denser on the bases of the segments, except the first, and forming a larger spot on the middle of each. First, second, and third segments with a single pair of median marginals; fourth segment with two or three pairs.

Legs black, middle tibia with one bristle on the outer front side; hind tibia with about a dozen forming a rather even row on the outer hind side and one large in the middle of the row.

Wings subhyaline, the base yellow, veins elsewhere black; first posterior cell open far before the apex; bend of fourth vein with a distinct fold but no fork; hind cross vein joining the fourth more

than two-thirds of the way from the small cross vein to the bend; last section of the fifth vein one-third the preceding. Veins bare except the third, which has four or five hairs at base.

Length, 6.2 mm.

Described from one male collected at Santiago, Chile, by Alfredo Faz.

Type.—Male, Cat. No. 28908, U.S.N.M.

Genus *PACHYOPHTHALMUS* Brauer and Bergenstamm

Pachyophthalmus BRAUER and BERGENSTAMM, Zweifl. Kais. Mus., pt. 4, 1889, p. 117; pt. 6, 1893, pp. 170, 195.—ALLEN, Proc. U. S. Nat. Mus., vol. 68, art. 9, 1926, p. 7.

PACHYOPHTHALMUS ORNATICAUDA, new species

Male.—Front 0.21 of head width, covered with yellowish pollen and having the usual double row of bristles to the antennae. Parafacial with slightly paler pollen, the facial ridges with a few small bristles above the vibrissae; antennae black, the third joint a little longer than the second; arista short; palpi black, proboscis short.

Thorax shining black with very striking white pollinose stripes, one on each side of the middle, and another from the humerus to the root of the wing having a more yellow tinge behind the humerus. When viewed from behind there is also an incomplete stripe from the suture to the postalar declivity above the root of the wing. The white stripes next to the middle reach to the apex of the scutellum. Pleura very pollinose, a black stripe from the humerus passing below the root of the wing and another indefinite stripe along the upper edge of the sternopleura.

Abdomen black with a paler pollinose stripe on each side of the median line partially divided into spots and composed of pollen which shows some brown reflections; the first three segments are broadly gray pollinose below and on the sides, that on the sides forming a silvery spot on the second and third segments, the fourth segment deep golden pollinose, especially well colored on the sides, the hind edge wider in the middle, shining black. Genital segments black; inner forceps shining black, the outer yellow.

Legs black, the claws and pulvilli elongate. Wing hyaline with the usual venation for the genus.

Length, 5.2 mm.

Described from one male, collected at Perales, Chile, by Father Pirion and transmitted to the U. S. National Museum by Alfredo Faz.

Type.—Male, Cat. No. 28909, U.S.N.M.

The species has some resemblance to *P. trivittata* Townsend, described from Peru,³ but the general color of the thorax and abdomen is much blacker and the pollen is rather bluish instead of yellow so that the deep golden or almost orange pollen of the fourth segment makes a very strong contrast.

Genus BRACHYCOMA Rondani

Brachycoma RONDANI, Dipt. Ital. Prod., vol. 1, 1856, p. 69.

Laccoprosopa TOWNSEND, Trans. Amer. Ent. Soc., vol. 18, 1891, p. 365;

Ins. Ins. Menst., vol. 3, 1915, p. 116.

Bombobrachycoma TOWNSEND, Ins. Ins. Menst., vol. 6, 1918, p. 157.

BRACHYCOMA RUFICAUDA, new species

Entirely black except the fifth abdominal segment in female and second genital segment of male, which are bright reddish-yellow.

Male.—Front at narrowest one-fourth the head width (three measured 0.26, 0.26, and 0.27), the median stripe broad, black. Parafrontals silvery but with dark reflections especially opposite antennal insertion; frontals reaching level of arista; parafacials silvery above, grayish below, width at narrowest half that of third antennal joint, about four large bristles and a few hairs on lower part near eye; facial ridges bare except near vibrissae, which are at oral margin; epistoma prominent; palpi black; cheek one-fourth of eye height. Third antennal joint hardly twice the second, arista pubescent near base, its second joint distinct but hardly elongated; back of head not very bulging, with only black hair.

Thorax black with four narrow stripes of white pollen, the outer on the margin, the inner just mesad of dorsocentrals and extending in some lights rather vaguely upon the sides of the scutellum; another pair of stripes lie above the supraalar bristles and in rear view extend across the suture anteriorly. Chaetotaxy: dorsocentral 3,3; acrostichal 0,0; humeral 3; presutural 1; notopleural 2; supraalar 2; intraalar 2; postalar 2; sternopleural 2,1; scutellum with two lateral pairs, no apical, the disk with numerous upright slender hairs, no post scutellum. Abdomen black with bluish reflection, viewed from behind with four rows of silvery pollinose spots on second to fourth segments; second segment with one median marginal pair of bristles, third with marginal row of 10, fourth with marginal row of 12 or more; venter black with four pairs of white pollinose spots, not very distinct. First genital segment shining black, with a row of stout bristles; second red with bristles and hairs not in rows on posterior part. Inner forceps red at base, becoming black and slender and curving forward and slightly outward to a sharp tip. Outer forceps

³ Proc. U. S. Nat. Mus., vol. 43, 1912, p. 363.

as usual reduced to small red lobes. Penis rather long, black except at base, the tip suddenly bent forward in two flat rounded lobes, somewhat hoodlike, under which several minute sharp processes project toward the base of the organ; about the middle on the front side a flat attachment arises which extends cephalad and then curves broadly toward the tip of the penis, usually resting against it in the spread specimens. Posterior claspers slender and curved clawlike, anterior shorter and less slender, the extreme tip notched into two minute points.

Wing subhyaline, costal spine distinct, third vein hairy almost to the crossvein, first vein usually with one to four coarse hairs or spinules near middle (absent in both wings in 4 specimens out of 23).

Female.—Front one-third of head width (0.33, 0.34, 0.37 in three specimens measured); the usual two pairs of orbital bristles. No median marginals on second segment, on the third a noticeable space between the median pair and the rest of the row. Fourth abdominal segment above and three evident sternites below, yellowish red, contrasting as in the male with the rest of the abdomen. The rows of pollinose spots on dorsal surface of abdomen are larger than in the male, tending to be a little tessellated. The hairs of scutellum and abdomen are less erect than in the male.

Length, 4 to 7.5 mm.

Described from 8 males and 15 females; 20 including the type are from Angol, Chile, collected by D. S. Bullock in December, 1925, and January, 1926; one from Santiago, Chile, collected by A. Faz in 1923; two are from Southern Chile, collected many years ago by M. J. Rivers.

Type.—Male, Cat. No. 40963, U.S.N.M.

The species differs from the type of the genus, *Tachina devia* Fallen, with which it has been compared, in having the head less bulging behind, the parafacial with stronger bristles, the prescutellars wanting, and the costal spine stronger, as well as in the usual presence of a few setules on the first vein.

Family TACHINIDAE

CALLESTHES, new genus

The genotype is a minute muscoid fly with hypopleural bristles, well developed postscutellum and plumose arista. Front rather prominent, antennal axis about one-fifth longer than vibrissal. Antennae inserted at the middle of the eye; face flat below with very slight keel on upper part; vibrissae at oral margin, which is somewhat above the lower edge of the head. Facial ridges bare; palpi ordinary, proboscis small. Cheek nearly one-half the eye height. Male with a single pair of rather large verticals; frontals beginning some

distance before the ocelli, none reclinate, extending barely to the antennae. Parafacial with delicate hairs in a single row. The dorsocentral immediately before the suture and the last one before the scutellum are much larger than those anterior to them. Abdomen without discals. Wing somewhat rounded, a well-developed costal spine; first vein bare, rather short, ending just in front of the small crossvein, the large crossvein straight and rather erect, joining the fourth vein half way between the crossvein and the bend, which is obliquely rounded. Apical crossvein concave, the cell ending just before the apex.

CALLESTHES HISTRIO, new species

Male.—The whole fly is opaque black with the following parts white pollinose: the orbits, parafrontal, parafacial, face, a narrow crossband on the thorax just in front of the suture which extends forward at the sides to the hind edge of the humerus and obliquely downward across the pleura to include the middle of the sternopleura as far as the coxa; another white crossband just in front of the scutellum extending laterally to the postalar calli and anteriorly to the hindmost dorsocentral; the second, third, and fourth abdominal segments have at the front edge a broadly interrupted narrow crossband.

Front 0.21 of head width at the narrowest part, which is a little above its middle, the median stripe is very narrow especially toward the antennae, where it is not more than one-third of the width of one parafrontal. The parafacials are about as wide as the third antennal joint. Antennae black, the third joint one and a half times the second, the extreme base of the arista rather strikingly swollen, suddenly becoming slender where the plumosity begins; palpi black. Cheek one-third the eye height, almost entirely bare, the transverse impression soft and reddish.

Thoracic chaetotaxy: acrostichal 3, 3 (all small); dorsocentral 2, 3; intraalar 2; supraalar 2 (the hind one hairlike); postalar 2; humeral 2; posthumeral 1; notopleural 2; presutural 2 (the inner minute); sternopleural 1, 1; scutellum with one large lateral and one large apical, no distinct discal. First abdominal segment with marginal row of bristles mostly rather small; second segment with a marginal row, the median pair and one lateral pair large; third segment with marginal row of eight rather large; fourth segment with a similar marginal row, no discals.

Legs black, pulvilli brown, not much enlarged. Middle tibia with one stout but not long bristle on outer front, two on outer hind side and one flexor. Hind tibia with two bristles only on outer hind side; same on inner hind side.

Wings dark brown, calypters a little lighter brown; third vein with two hairs at base.

Length, 4 mm.

Described from two males collected by F. X. Williams at Tena, Ecuador, February 17, 1923. The paratype is returned to the Hawaiian Sugar Planters' Association.

Type.—Male, Cat. No. 40980, U.S.N.M.

The striking and beautiful pattern of the markings is very similar to *Lydellothelaira collaris* Townsend and also like Wiedemann's *Zosteromyia dilecta*, but these are entirely different in many characters.

DAETALEUS, new genus

Belongs to the tribe Theresiini, and agrees with the genotype of *Theresia* (*tandrec* Robineau-Desvoidy) in having the facial keel slight above, disappearing below; palpi and proboscis of ordinary form; no discs on first three abdominal segments and no marginals on first two; and in various minor characters. It differs mainly in having the epistoma much more protuberant, and quite strikingly in possessing the metallic color of many Calliphorids.

Hypopleural bristles and postscutellum well developed. Front not prominent, antennal axis shorter than vibrissal; frontal stripe (male) triangular; only one small pair of verticals, a cluster of proclinate hairs arising from ocellar triangle; frontals barely reaching antennae, small; parafacials, eyes and facial ridges bare; antennae arising below level of eye middle, third joint twice the second, arista plumose; vibrissae above epistoma, not approximated; back of head not bulging. Calypters bare above. Abdomen short and broad, the sternites concealed, only showing a little of first segment.

DAETALEUS PURPUREUS, new species

Male.—Front narrow above, before ocelli hardly wider than ocellar triangle and the median stripe reduced to a line; head entirely yellow in ground color except upper part of back, and with yellow pollen; palpi and antennae wholly yellow, including arista, which has thin and erect plumosity; beard yellow in most lights but the shorter hairs changeable. Thorax blackish, the sides and scutellum metallic. Chaetotaxy: humeral 3, notopleural 2; posthumeral 1; presutural 2 one side, 3 the other in close longitudinal row; acrostichal 0, 2; dorsocentral 3, 4; intraalar 2; supraalar 3; postalar 2; sternopleural 2, 1; scutellum with 2 large marginals, 1 apical and 1 discal, all represented by scars in the type. Calypters of usual size nearly white. Abdomen wholly metallic purple, mostly

shining; all the segments with thin whitish pruinosity above in certain angles, more constant below; fourth segment with some smallish bristles, only scars in the type; genitalia (fig. 1) small, with characteristic broad lobe like outer forceps of the "Dexiidae," the penis long, slender, and jointed. Legs yellow (only the front ones present).

Wings distinctly infuscated; fourth vein obliquely but rather angularly bent, the first posterior cell rather widely open distinctly before the apex; first vein bare, third with three or four small hairs at base.

Length, 8 mm.

Described from one male, collected in Brazil by Beske, sent for identification by the Vienna Natural History Museum, to which it is returned.

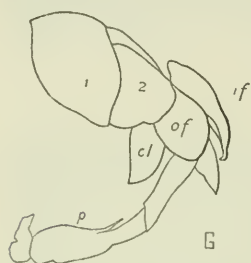


FIG. 1.—DAETALEUS PURPUREUS. GENITAL SEGMENTS AND GENITALIA OF MALE FROM LEFT SIDE. 1, 2, GENITAL SEGMENTS; if, INNER FORCEPS; of, OUTER FORCEPS; cl, CLASPER; p, PENIS. (DRAWN BY C. T. GREENE)

Genus INCAMYIA Townsend

Incamyia TOWNSEND, Proc. U. S. Nat. Mus., vol. 43, 1912, p. 317. Female only; type and sole species, *cuzcensis*, new.

Sphalloglandulus TOWNSEND, Pros. U. S. Nat. Mus., vol. 49, 1915, p. 438. Male only; type and sole species, *S. unicus*, new, equals *cuzcensis*.

The synonymy is from the type specimens in the National Museum. Both species were described from Peru; Townsend placed *Incamyia* in the family Phaniidae, and *Sphalloglandulus* in his Exoristidae. He apparently combined these families with Tachinidae later.

The genus is allied with *Lydella* and *Eucelatoria* in having infrascapular setules (a small group of minute hairs on the thorax just below the line of attachment of the hind calypter), except in one species noted below, and in having in the female sex a keeled abdomen with piercer of about the same type. From *Lydella* it differs in having hairy eyes, and from *Eucelatoria* also by having the facial ridges much more bristly and the second antennal joint longer. *Phorocera* is also a related genus, but it has the second antennal joint less than half the third, the face more receding, small apical scutellars, and no median upright pair of discal scutellars.

The type species of *Incamyia* and the three new species here described form a very compact group occurring in Peru, Chile, and Argentina, all being black in color with mesonotum bearing a median whitish stripe and a well-defined lateral border of the same, so as to give the effect of a heavy black stripe each side of the middle on white ground. The face is nearly vertical, back of head prominent below, cheek equal to nearly one-third of eyeheight. The back of head

below has mostly black hairs, the white ruff being small. Proboscis and palpi of ordinary form, the latter black or very dark reddish; vibrissae almost at edge of mouth, facial ridges with strong bristles almost meeting the frontals, which descend nearly or quite to the arista. Second antennal joint more than half the third, arista with basal joints short. Female with three pairs of orbital bristles, the anterior proclinate, the other two turned more outwardly; ocellars present and proclinate. Thorax with three posterior dorsocentrals, acrostichals 3,3, sternopleurals 2,1, inner presutural present. Scutellum with a median discal pair of upright slender bristles close together, and another pair nearer the tip and farther apart, the space between the discals and the tip bare; three lateral pairs of scutellar bristles, the last long and divergent, no apicals between them. Intermediate abdominal segments with each a single pair of discals. Middle tibia with three or four bristles on outer front side; hind tibia not ciliate, males with front pulvilli and claws moderately elongated. Fourth vein ending far before the tip of wing, third with only a few hairs at base, first bare. Costa with distinct spine.

KEY TO SPECIES OF INCAMYIA

1. First posterior cell petiolate; second to fourth abdominal segments with sharply defined pollinose pale band covering basal third, remainder of these segments shining black----- *striata*, new species.
First posterior cell open or barely closed in margin----- 2
2. Infrascapular hairs absent; basal pollinose abdominal bands as in preceding, but still narrower and more or less interrupted in the middle; scutellum pollinose only at tip----- *spinicosta*, new species.
Infrascapular hairs present; pollen on abdomen not confined to distinct basal bands; scutellum pollinose from base to tip----- 3
3. Abdomen mostly gray pollinose, hardly at all tessellated, the pollen in the male extending upon the venter----- *cuzcensis* Townsend.
Abdomen mostly dark, the pollen tessellated, in the male not extending upon the venter----- *chilensis*, new species.

INCAMYIA SPINICOSTA, new species

Male.—Front one-fourth the headwidth at narrowest part (by micrometer .24, .26 and .26, in three specimens); parafrontal and parafacial silvery, uniform in color, the parafacial a little narrower than width of third antennal joint; cheek one-third the eye height, its anterior part with a few bristles below the transverse impression.

Abdomen shining black, with silvery basal band on segments 2-4; first segment with a large pair of median marginals; second segment with large discal and marginal pairs; third with discal pair and marginal row of 12; fourth with numerous erect discals irregularly arranged. Genitalia small, black. Posterior forceps minute, separate, almost straight; anterior forceps (outer) red at base, flat and blade-like.

Wings subhyaline; fourth vein with rounded bend and thence straight to costa well before apex.

Length, 7 mm.

Described from two males from Perales, Chile, September 23, collected by Father Anastase Pirion. The place is Quilpue, about 30 kilometers from Valparaiso. These were transmitted by Alfredo Faz of Santiago.

One additional male, collected by Father Pirion, at the same place and on the same day, is larger (8.3 mm.) and has on the middle of the small crossvein in each wing a very large semierect spine, about as long as the hind crossvein. At first I supposed this would be a generic character, but the receipt of additional material lacking it and agreeing in other respects compels me to believe provisionally that this is a remarkable abnormality of the single specimen.

A female was collected by Edwards at L. Corrientes, Rio Negro Territory, Argentina; it is in the British Museum.

Type.—Cat. No. 28875, U.S.N.M.

INCAMYIA STRIATA, new species

Male.—Slightly smaller than *I. spinicosta*, differing by the characters mentioned in the key. The median pollinose stripe extends very distinctly in its full width to the tip of the scutellum; the basal white pollinose crossbands of the abdomen are very well defined and the segments are polished for the greater part of their length. The crossbands end abruptly just under the margin of the abdomen leaving most of the venter shining, or with very slight even pruinosity. Genitalia small, not spread. The apical crossvein not quite so oblique as in the other species, joining the third vein so as to leave a well defined petiole about as long as the anterior crossvein.

Length, male, 5 and 5.4 mm.

Described from two male specimens collected by C. H. T. Townsend at Oroyo, Peru, May 7 and 28, 1914.

Type.—Male, Cat. No. 40835 U.S.N.M.

INCAMYIA CHILENSIS, new species

Male.—Greatly resembles *I. spinicosta* in all respects, but differs in the characters mentioned in the key. When viewed directly from behind the pollen of the abdomen covers thinly almost the entire dorsal surface, more dense at the base where in side view it seems to form slightly interrupted crossbands. The fourth segment in side view is shining except at base.

Female.—Front at vortex .34 of headwidth, uniformly widening toward the mouth. Pollen of parafrontal and parafacial with a slight tinge of yellow.

Abdomen with a pronounced keel below on the second and third segments with a good sized curved piercer folded in, the edge of the keel in the third segment bears a series of very short but stout spinules not very noticeable; second segment with a very few spinules almost imperceptible. Dorsally the last three segments of the abdomen are pretty well covered with pollen which is yellowish on the fourth segment; the tip of the fourth segment and a large indistinct subtriangular area on the sides of the second and third are more shining black. The pollen becomes thinner at the margin so that the venter is almost shining.

Length, male 6.4 to 6.7 mm.; female, 5.5 to 6 mm.

Described from eight males and seven females. Four males including the type, and one female and allotype, are from Angol, Chile, collected in October and December, 1925, by D. S. Bullock; two males and four females from southern Chile (M. J. Rivers), one labeled, "Parasite of *Plusia depauperata*"; one male from Perales, Chile, September, 1923, collected by Alfredo Faz; one male from Calamarca, Argentina, swept from chrysanthemums by Max Kisiuk, May 23, 1927; one female from La Lajija, Argentina, June, 1927, swept in orchard by Max Kisiuk; and one female from Dolores, Buenos Aires, Argentina, March 29, 1927, swept in orchard by Max Kisiuk.

Four additional specimens are in the Edwards collection from Chile (British Museum)—a male from Llai Llai (a very small village 2 miles from Los Loros), a female from Los Andes, two males from Ancud and Puntra in S. Chiloe.

Shannon collected two males at Los Lóros, Chile.

Type.—Male, Cat. No. 40836 U.S.N.M.

REEDIA, new genus

Related to *Peleteria*, but without palpi and with the bristles very strongly developed, those of scutellum and of abdomen above and below are straight and spine like. Chaetotaxy, head: vertical 2 large pairs; ocellar well developed, proclinate; orbital in female 3 (uppermost smaller); frontals about 11, the upper 2 reclinate and diverging, remainder converging toward middle line, lowest near eye at level of middle of second antennal joint. Thorax: acrostichal 2, 3 (none just before suture); dorsocentral 3, 4; humeral 7; posthumeral 2; presutural 2; notopleural 2; supraalar 3 very strong; intraalar 3; postalar 2 large and 2 small; sternopleural 2, 1; pteropleural 2 large; scutellum with 2 large laterals and a smaller diverging depressed

apical pair, besides numerous erect spines. Abdomen: first segment without median marginals; second with about 4 pairs of median marginal spines and some shorter on the disk before them, also 5 pairs at sides; third segment with a marginal row across dorsal surface and continuing below to ends of tergites on the venter, in middle dorsally a few small subdiscal spines as in preceding; fourth segment above and below wholly spiny except anterior third across dorsum. All the sternites bear groups of erect spines.

Proboscis slightly elongate; second antennal joint nearly as long as third, which is convex in front; penultimate joint of arista elongate; face protuberant over mouth, its lateral ridges with only a few bristles above vibrissae.

Type of genus.—*Reedia robusta*, new species.

REEDIA ROBUSTA, new species

A large, stout, blue-black species, abdomen wholly shining.

Female.—Front broad, 0.36 and 0.38 of the headwidth in the two specimens, subshining bluish-black as far down as the frontal bristles extend; parafacials with silvery white pollen and a few conspicuous black hairs, and bearing two large bristles below (one specimen has two on one side and only one on the other). The ruff of hairs on back of head is deep yellow. Thorax almost destitute of pollen; calypters white. Wings subhyaline; third vein with 8 or 10 hairs at base; bend of fourth vein rectangular; first posterior cell ending in costa far before apex of wing.

Legs black, very bristly; middle tibia with several stout bristles on outer front side.

Length, 15 to 16 mm.

Described from two females collected by Alfredo Faz; one (type) was taken at Concepcion, Chile, the other at Mendoza, Argentina.

Edwards collected two additional females and Shannon one in Concepcion, Chile; the former are in the British Museum.

Type.—Female, Cat. No. 28896, U.S.N.M.

The genus is named in honor of the late Prof. Edwyn C. Reed, who published several valuable papers on Chilean Diptera, including a catalogue in 1888.

Genus ECHINOPYRRHOSIA Townsend

Echinopyrrhosia TOWNSEND, *Ins. Ins. Menst.*, vol. 2, 1914, p. 90.

ECHINOPYRRHOSIA TROPHOCYON, new species

Differs from the genotype (*alpina* Townsend) in having no palpi at all, and in having somewhat more numerous spines on the abdomen. As in *alpina*, the head is very long, the epistoma remarkably projecting. Front at vertex 0.31 of the head width, frontal bristles sparse,

hairlike above; parafrontals covered with long erect black hairs, which continue on the parafacial. The pollen of the head is dark olive. Parafacial nearly as wide as eye, cheek three-fifths the eye height. Proboscis a little elongated, but not so much as the oral cavity, so it readily folds out of sight entirely. Cilia behind eye remarkably long, back of head with thin ruff of yellow hair.

Thorax blackish, not distinctly striped, the black pile of dorsum long and erect; pleura also with the same pile, especially abundant on mesopleura. Scutellum with dense row of straight, stiff spines on margin and a few upright discal. Calypters dark brown.

Abdomen black without lighter markings, at first seeming to be entirely covered above and below with stout spines; but on careful examination the anterior dorsal half or two-fifths of the third and fourth segments and the whole of the very short first segment, except the sides, are seen to be almost wholly bare. There are very abundant spines in the middle of the venter and at the lateral edges, between these regions some shining black bare surface is visible. Femora black, tibiae and tarsi to tip red; claws red basally, pulvilli brown. Femora and tibiae very spiny.

Wings entirely infuscated; fourth vein with slightly acute bend a little rounded off, ending far before apex; third vein with only a few hairs at base.

Female.—Front 0.34 of head width, two proclinate orbitals.

Length, of both male and female, 12 mm.

Described from 1 male and 4 females collected by F. X. Williams, on Mount Tunguragua, Ecuador, January 18, 1923; received from Hawaiian Sugar Planters' Association, to which two paratypes are returned.

Type.—Male, Cat. No. 40982, U.S.N.M.

Genus CHAETOCRANIOPSIS Townsend

Chaetocraniopsis TOWNSEND, INS. INS. MENST., vol. 3, 1915, p. 68.

The type and sole original species is *C. chilensis* Townsend, described on page 69 of the above reference. It was described from a single male specimen, collected by E. C. Reed in Chile, and now in the United States National Museum. The genus was briefly described in comparison with *Chaetocrania*, but the generic characters of the latter were never published, as it was established by the mere citation of a species as type.⁴ The following notes are taken from the type specimen of *chilensis*. It resembles the genotype of *Gonia* (*capitata* De Geer) in having reclinate ocellars, the parafrontals and parafacials wide and with coarse hairs, second joint of arista

⁴ Townsend, Proc. Biol. Soc. Wash., vol. 28, 1915, p. 23; type, *Spallanzania antennalis* Coquillett.

elongated, face deeply depressed and narrow, its facial ridges high. It differs in having the facial ridges bristly almost up to the arista, which is short and thickened to tip; male without proclinate orbitals; the hairs of parafacials and parafrontals much coarser and more erect; the size considerably less, and the body more slender. Otherwise it is structurally very much like *Gonia*.

KEYS TO SPECIES OF CHAETOCRANIOPSIS

MALES

Arista with blunt tip, pulvilli of front tarsi longer than last tarsal joint; about 13 pairs of frontals----- *chilensis* Townsend.
 Arista with acute tip, although thickened for most of its length; front tarsi with small pulvilli; about 8 pairs of frontals----- *argenteiceps*, new species.

FEMALES

Pollen of parafrontals and parafacials plumbeous----- *chilensis* Townsend.
 Pollen of parafrontals and parafacials silvery----- *argenteiceps*, new species.

CHAETOCRANIOPSIS CHILENSIS Townsend

Chaetocraniopsis chilensis TOWNSEND, Ins. Ins. Menst., vol. 3, 1915, p. 69.

Besides the male type, the museum has received two females collected by Senor A. Faz at Perales, Chile. They have two pairs of orbitals, the arista is acute at tip, the third antennal joint is one and one-half times the second, the parafrontals and parafacials are somewhat less bristly than in the male. They differ from the females of *argenteiceps* in having the front of head more bristly, as well as in the color of its pollen.

CHAETOCRANIOPSIS ARGENTICEPS, new species

Male.—Front 0.48 of head width at vertex, inner edge of eyes straight and slightly diverging, separated by 0.61 of head width just above vibrissae; parafrontals and parafacials silvery, with less numerous bristles than in *chilensis*; antennae black, basal joints red, second hardly more than one-fourth as long as third, arista about two-thirds as long as third antennal joint, its apical segment four times the preceding; palpi yellow; cheek one-fourth eye height, distinctly narrower than parafacial, with black hairs; beard of back of head white. Thorax black, with indistinct stripes of pale pollen; dorsocentral 3, 4; sternopleural 4; scutellum with 3 marginal, a spiny suberect apical pair, and a small discal pair; calypters white. Abdomen shining black, basal half to three-fourths of second and third segments above white pollinose, which does not continue below. First and second segments with a pair of median marginals; third with a stout marginal row of 10; fourth with a smaller mar-

ginal row, no discs on any of the segments. Legs black; mid tibia with two erect bristles near middle of outer front side, two on outer hind, and one more sloping on flexor; hind tibia with several irregular on outer hind, two on inner hind and two on outer front side.

Wings subhyaline; third vein with 2-3 setules at base, fourth vein with rounded oblique bend, thence nearly straight to costa, more erect than usual.

Female.—Front 0.43 of head width at vertex, face 0.58 just above vibrissae. Second antennal joint one-half the third; a pair of proclinate orbitals.

Length, male 7 mm.; female 6.3 mm.

Described from a pair collected at Perales, Chile, by Rev. A. Pirion.

Type.—Male, Cat. No. 41390, U.S.N.M.

Genus SELENOMYIA Brauer and Bergenstamm

Selenomyia BRAUER and BERGENSTAMM, Zweifl. Kais. Mus., pt. 5, 1891, p. 361; pt. 6, 1893, p. 170.—ALDRICH, Annals Ent. Soc. Amer., vol. 18, 1925, p. 459.

The type species, and the only one so far known, is *S. brevicornis* Brauer and Bergenstamm, mentioned and more or less described in all the above references. Only one specimen is known, the type, which I borrowed from the Vienna Museum and later sent back. I am now describing three additional species which I refer to this genus; like the genotype, they are from Chile, where it seems to be a characteristic form. The third species, *facialis*, differs from the others in having the parafacials hairy and may ultimately go into a new genus; but from the slight taxonomic value of this character in other dexiid groups, as, for instance, *Ptilodexia* and *Rutilia*, I do not believe it is generic in the present case.

In this genus there is a high, sharp carina on the face, and the facial ridges are decidedly convergent and prominent below, so that there are well-marked and deep subantennal depressions which are entirely separated. The cheek is almost equal to the eye height and the parafacials are broad, about two-thirds of the cheek.

KEY TO THE SPECIES OF SELENOMYIA

1. Abdomen shining green, without pollen..... *virens*, new species.
Abdomen black, with pollinose markings..... 2
2. Tibiae reddish-yellow; second and third abdominal segments with a pair of arcuate spots of pollen..... *brevicornis* Brauer and Bergenstamm.
Tibiae black, abdominal spots not arcuate..... 3
3. Parafacials bare except on upper part..... *plena*, new species.
Parafacials with coarse hair down to the lower edge of the eye.
facialis, new species.

SELENOMYIA VIRENS, new species

Male.—Dark metallic green in color, the abdomen wholly shining. Arista bare, hypopleural bristles and postscutellum well developed. Front at vertex narrow, only 0.16 of head width. Dimensions of head in micrometer units: height 66 (eye 38); length (antennal axis) 48; width 74. Vibrissal axis almost as long as antennal, but both back and front of head recede a little below. Pollen of parafrontals dark gray, that of parafacials decidedly brown, between is a large blackish spot on each side of the base of antennae, most distinct from in front. Vibrissae about two-thirds the length of the third antennal joint above the oral margin; facial ridges densely bristly and decidedly convergent on lowest third; face with thin, sharp carina, forming decided antennal grooves; antennae black, third joint hardly twice the second, arista of moderate length, its penultimate joint distinct but hardly elongated. Palpi dark yellow, of normal size; proboscis short, fleshy. Beard black.

Thorax dark green, with three broad stripes of white pollen which are distinct at front edge, but fade on the disk and are hardly visible at the suture. Humeri and sides of thorax before wings also with white pollen. Chaetotaxy: acrostichal 3, 3; dorsocentral 3, 4; humeral 6; posthumeral 3; presutural 1; notopleural 2 (with hairs around bases); supraalar 3-4; intraalar 3; postalar 2; sternopleural 2, 1; scutellum with three large lateral pairs, of which the third might be called large divergent apicals, and one or two pairs of widely spaced smallish discals. Calypters brown with blackish border.

Abdomen wholly shining dark green; second abdominal segment with two pairs of median marginals and two pairs of discals, one behind the other; third segment with two pairs of discals and a marginal row; fourth segment with a few erect bristles irregularly placed. Fifth sternite deeply cleft, the lobes with hairs only; genital segments small, dark brown; inner forceps united into a slender, almost needlelike organ, the outer forming broad concave plates as in many dextiids, but in this species decidedly truncate; penis a very slender black plate with a pale prolongation and at the base a pair of erect bladelike semitransparent pieces (claspers?).

Wings subhyaline, first posterior cell open and ending considerably before the apex; fourth vein curved backward at the bend, which is rectangular and slightly rounded; third vein with three or four setules at base.

Legs black, claws and pulvilli elongated, the latter brownish; front tibia with two outer bristles; middle tibia with three on outer front side; hind with a few irregular on outer side.

Female.—Front 0.27 of head width; two pairs of proclinate orbitals. Second abdominal segment with a single pair of median marginals, no discals.

Described from two males and one female, collected at Perales, Chile, near Santiago, by Rev. Anastase Pirion.

Type.—Male, Cat. No. 41382, U.S.N.M.

SELENOMYIA PLENA, new species

Male.—Like *virens*, but lacking the green color, and with abdominal markings. Black throughout, only the palpi yellow; parafacials brown, but without distinct blackish spot above; calypters white, the rim infuscated. Chaetotaxy as in *virens*, but the inner presutural is present; the third antennal joint is bulbous at tip; the dorsal pollinose stripes of the thorax are more distinct, being visible almost to scutellum; second and third abdominal segments with white pollen except on a broad median shining stripe and the posterior third of each, this pollen extending underneath almost to the middle. Fourth segment with very thin pollen on same portions. Second segment with one discal and one median marginal pair, third with one discal pair and marginal row. Genitalia black; the united inner forceps awl-shaped, the tip blunt, rounded, and turned back; outer forceps slender and pointed, not platelike. Front 0.24 of head width.

Described from one male, collected by D. S. Bullock at Angol, Chile, January 2, 1927; and a male and two females collected by Edwards at Concepcion, Chile; Peulla, S. Chile; and Lake Nahuel Huapi, Rio Negro, Argentina.

Type.—Male, Cat. No. 41383, U.S.N.M.

SELENOMYIA FACIALIS, new species

Female.—Front 0.26 of head width; only one pair of proclinate orbitals, which are high up and almost in the frontal row; the uppermost frontal small and turned outward (it is broken off in the female of *virens*, so I can not compare the direction and no other females are known); parafrontal and parafacial gray-brown pollinose, without distinct spot at antennae. Palpi brown; facial ridges on the convergent lower part not so bristly as in *virens*; arista pubescent; beard pale yellow except anteriorly; chaetotaxy and thoracic stripes as in *virens*. Abdomen black, almost covered with thin gray pollen, subshining in some lights, hind edges of segments shining; second segment with a marginal pair, third with marginal row, both with only a few stouter hairs in place of discals. Calypters white, the rim infuscated only on inner side. Legs as in *virens*, but the front tibia has a single outer bristle, and the hind one has a trace of reddish color on the middle. Wing as in *virens*.

Described from one female collected at Perales, Chile, by Rev. Anastase Pirion.

Type.—Female, Cat. No. 41384, U.S.N.M.

PIRIONA, new genus

Hypopleural bristles and postscutellum well developed; ocellars large in both sexes, curving directly to the side, neither proclinate nor reclinate; eyes and parafacials densely pilose; frontals ending hardly below base of second antennal joint; outer verticals not developed, inner strong, just behind them on occiput a smaller pair of convergent bristles, almost decussate; back of head bulging, front not prominent, antennal axis slightly exceeding vibrissal; cheek one-third of eye height, parafacial one-half of cheek; facial ridges bare, not prominent, vibrissae at oral margin, which is slightly above lower edge of head, not protruding; palpi normal, proboscis short, fleshy; antennae inserted just below level of middle of eye, reaching nearly to vibrissae, third joint rather wide, hardly twice as broad as long and much less than twice the second; arista bare, penultimate joint short; female with usual two pairs of proclinate orbitals. Scutellum with two laterals, a long decussate apical pair, and several irregular erect straight bristles. No acrostichals immediately before suture. A few minute infrasquamal setules present. Abdomen without median marginals on first segment, a pair of large discals and a pair of large marginals on second, third with a pair of large discals and a marginal row (marginals of second and third rather far forward). Female without piercer. Legs with large bristles, middle tibia with one large on flexor side, hind with several large bristles widely spaced on outer hind side. Wing of ordinary form, no costal spine, first vein bare, third with a few large hairs at base; fourth vein with angular, slightly oblique bend, ending distinctly before tip, the hind cross vein straight and joining fourth vein at last fourth of distance from small cross vein to bend.

I am unable to find a genus in the national collection with which this is closely related.

Genotype.—*Piriona fasciculata*, new species.

PIRIONA FASCICULATA, new species

Male.—Black, palpi at least basally and the tip of the second antennal joint reddish yellow. Front wide, 0.29 of head width on upper third, widening gradually; frontals 8, decussate, none reclinate, the first anterior to the ocellar triangle; frontal stripe wide, black; parafacials and parafrontals black, subshining; beard black. Thorax black, shining, with traces of white pollen at front edge only. Chaetotaxy: acrostichal 2, 2 (hindmost large and rather far before

scutellum); dorsocentral 3, 3; humeral 4; posthumeral 1; presutural 1; notopleural 2 (surrounded by hairs); supraalar 3; intraalar 3; postalar 2; sternopleural 2, 1; scutellum as mentioned. Calypters white, the rim blackish on inner edge. Abdomen broad and rather deep, the genital segments giving it a truncate appearance, subshining black but the intermediate segments with some thin white pollen in oblique view; bristles of fourth segment large and erect anteriorly, becoming denser and smaller on posterior part. First genital segment rather prominent, declivous, second more bulging. Inner forceps united into a slender black organ slightly bent forward at tip; outer forceps also black and slender; penis and claspers



FIG. 2.—*PIRIONA FASCICULATA*, NEW SPECIES. HIND LEG OF MALE. (DRAWN BY C. T. GREENE)

black but not distinctly visible in the only specimen. Legs rather stout, front claws and pulvilli a little elongated; mid tibia with several bristles on outer front side, one at the middle fully half as long as the tibia, and one of almost the same length on the flexor side; hind tibia besides those on outer hind side has three on outer front and the same on inner hind. Hind coxa with a fasciculus of long black hairs on inner edge; hind femur curved, with a prominence at two-thirds of its length below, bearing a remarkable fasciculus of long black hairs. (Fig. 2.) Wing grayish, gradually becoming more clouded toward base.

Female.—Front at vertex 0.30 of head width, very gradually wider anteriorly. Genital segments not in position to examine, but evidently without piercer. Hind femur without fasciculi.

Length, 6.2 mm.

Described from one male and one female collected at Marga Marga, Chile, by Rev. Anastase Pirion, after whom I name this remarkable genus. Also from one male collected by Edwards at Bariloche, Rio Negro, Argentina (British Museum); and three males collected by Shannon, two at the place just mentioned, the other at Lago Gutierrez, Rio Negro, Argentina.

Type.—Male, Cat. No. 41385, U.S.N.M.

THREE NEW SPECIES OF TWO-WINGED FLIES OF THE FAMILY BOMBYLIIDAE FROM INDIA

By J. M. ALDRICH

Associate Curator, Division of Insects, United States National Museum

The following new species of Bombyliidae were reared by C. P. Clausen as secondary parasites on Hymenoptera of the genus *Tiphia*, which were parasites of scarabaeid beetles of the subfamily Rutelinae in India. Mr. Clausen also reared *Hyperalonia oenomaus* Rondani with the same habits and in the same region.

APHOEBANTUS CLAUSENI, new species

Male.—Ground color black except femora and tibiae. Head globose, hind margin of eye with the usual deep notch and bisection; occiput with deep cleft behind vertex; front at vertex twice as wide as ocellar triangle, gradually widening to antennae, where it is about one-fourth of the head width; face receding; front and face with black hairs, the former with golden appressed scales, the latter with erect yellow hairs mixed with the black; antennae short, the third joint obliquely onion-shaped, the basal enlarged part shorter than second joint, the style about equal to half the slender part of the joint. Dorsum of thorax and scutellum thinly covered with appressed deep golden tangled hairs mixed with erect slender black ones; a collar of yellow hairs next to head; pleurae glaucous, mesopleura with abundant yellow hairs; three rather large black bristles before base of wing and several on postalar callus; scutellum with four pairs of black bristles on margin, equally spaced. Abdomen with same golden appressed hair as mesonotum, mixed with black hairs not so erect; first segment with dense brush on each side of erect blunt yellow hairs. Legs yellow, the coxae, base of front femora, tip of hind femora above, and tarsi black; all the tibiae with rows of small spines; pulvilli normal; hind femur without row of bristles on lower hind edge. Halteres yellow, distal part of stem and base of knob infuscated. Wings brown, gradually paler posteriorly; second vein branching from third opposite extreme base of

disal cell; anal cell wide open; second vein joining costa at a right angle.

Length, 4.5 to 6 mm.

Described from three males, Shillong, India.

Type.—Male, Cat. No. 40301, U.S.N.M.; one paratype will be deposited in the British Museum.

Only one species of *Aphoebantus* has been described from India heretofore, *ceylonicus* Brunetti, which has the thoracic and scutellar bristles yellow, as well as the erect hairs on thorax and abdomen; the description indicates that the abdomen is more or less banded, which is not the case in *A. clauseni*.

APHOEBANTUS SERATUS, new species

Male.—Differs from *A. clauseni* only in the following: The front at vertex is considerably narrower; the middle femora are black on basal half or more; the hind femora have a row of distinct spines on lower inner edge from base almost to tip; the wings are paler, the only distinct infuscation being at extreme base and in the subcostal cell; the first and third veins on the dorsal surface are smooth, while under high power they appear dotted in *A. clauseni* as if hairy, although I can see no hairs on them in my specimens. Third antennal joint missing.

Length, 5.2 mm.

Described from one male, Shillong, India.

Type.—Male, Cat. No. 40302, U.S.N.M.

EXOPROSOPA SIPHO, new species

Female.—Ground color black except the tibiae and basitarsi. Wings deeply infuscated on basicostal half with spots on the forks of veins in the clear portion.

Front of head at vertex about one-fifth the width of the head, widening to one-third at the antennae. Thinly sprinkled with elongate yellow appressed scales and erect black hairs. Face with the same covering, slightly brown at edge of mouth. Proboscis considerably elongate, when directed forward exceeding the antennae.

Thorax rather sparsely sprinkled with the same scales as on the head, more dense on scutellum; some black bristles in front of wing and on the postalar region, the latter also having rather dense and somewhat elongated yellow hair. Mesonotum and scutellum also with erect delicate hairs which are more brown than black in the middle part. Pleura with a dense tuft of black hairs on upper half of mesopleura, the lower half with thin and delicate but rather long hair. Sternopleura with a few mostly yellowish hairs which extend upward along the anterior part of the pteropleura, the metapleura with long dense bristly hairs which are about one-half yellow.

Abdomen black with mixed black and yellow appressed scales. On the first segment there are dense long, erect, scaly hairs at the sides, continuing in a thin and reduced series across the middle. The second segment shows a few paler scales across the base, hardly enough to call crossbands; the following segments show scarcely any banding except the last three which when viewed from behind show mostly black scales across the base. The sides of the abdomen are fringed with large blunt, black scales, a few whitish. The venter is covered with long, slender, yellow hairs not very dense. Legs covered with mixed light and dark scales. Pulvilli wanting; hind femur with a row of about seven bristles on the lower front edge. Wing dark brown on basicostal half, brownish hyaline on the remainder, the line of division not very distinct, running obliquely from the middle of the axillary cell to the costa just before the apex. All the forks and crossveins bear spots and there is a slight trace of additional infuscation along the anterior fork of the second vein near its tip, a less distinct trace on the posterior fork of the same and a slight spot in the open apex of the anal cell.

Length, 4.6 and 4.8 mm.

Described from two females, Shillong, India.

Type.—Female, Cat. No. 40303, U.S.N.M.

This species is close to *Exoprosopa insulata* Walker, but according to the descriptions of Brunetti and Nurse *E. sipho* differs in having a much longer proboscis, the dense bristly hairs of the pleura confined to the upper edge, the abdomen with very indistinct bands and with well-developed scales along the edges, and the venter covered with pale hairs. In the paratype specimen the proboscis would, if directed forward, extend a little beyond the antennae, but in the type the organ is lengthened out as if by the straightening of an elbow so that it is about as long as the whole body not counting the head; or as it projects downward from the head its length is equal to about two and a half times the vertical diameter of the head. The paratype specimen will be deposited in the British Museum.



NEW FOSSIL PEARLY FRESH-WATER MUSSELS FROM DEPOSITS ON THE UPPER AMAZON OF PERU

By WILLIAM B. MARSHALL

Assistant Curator, Division of Mollusks, United States National Museum

The United States National Museum has recently received some fossil Naiads collected by Prof. Joseph T. Singewald, of Johns Hopkins University, in deposits at the headwaters of the Upper Amazon, Peru; also another sending collected by Dr. Harvey Bassler, likewise from Peruvian deposits. The exact geological horizon from which these shells were obtained has not been definitely settled to date. Conrad¹ says, "It is not possible to state without doubt what the relative stratigraphical position of this group may be, but if all the species are extinct it can not be later than the Tertiary. The Pleistocene origin of the group is at least very doubtful." None of the species found in these deposits are living to-day.

Associated with these mussels were large numbers of *Anisothyris*, *Isaea*, *Neritina*, and other fossils, which are brackish-water forms. It is quite possible that the Naiads were swept in to these deposits from higher levels by floods, and thus came to be mingled with the brackish-water faunas. These shells, therefore, argue for the existence of bodies of fresh water at the time they were living at or near the place where they were found.

Until now only one Naiad has been described from the deposit, namely, *Anodon batesii* Woodward. As *Anodon* (= *Anodonta*) does not occur in South America, this shell is probably an *Anodontites* belonging in the family Mutelidae. The new species described herein belong in the subfamily Hyriinae of the family Mutelidae and are the first fossil species of that subfamily described from South America. They are related to two genera, *Diplodon* and *Hyria*, as will be shown in the remarks under the new genus *Prodiplodon*.

PRODIPLODON, new genus

Pearly fresh-water mussels of the family Mutelidae with beak sculpture resembling that of the genus *Diplodon* and also that of

¹ Amer. Journ. Conch., vol. 6, p. 192, 1870.

the genus *Hyria*, and consisting of several V-shaped undulations, "nesting" one within the other, and other undulations on the anterior and posterior umbonal areas, each pair of which if continued would form another V in the series.

Type of the genus.—*Prodiplodon singewaldi*, new species, described in this paper.

This genus is distinctly related to *Diplodon* and to *Hyria* and seems to stand about midway between them. In *Diplodon* the undulations are more nearly direct radial than V-shaped. In *Hyria* they are composed of "nested" V's but in that genus the shell is alate anteriorly and posteriorly. The fossils at hand give no indication of having been alate posteriorly, but in the type the anterior end is minutely winged. It is possible that this genus was the forerunner of both *Hyria* and *Diplodon*. *Prodiplodon* may have one living representative in "*Castalia*" *pazi* Hidalgo,² the type locality of which is Imbabura, Ecuador. Simpson³ places it in the genus *Diplodon*. From the description and figure it appears to be a *Prodiplodon* and a direct descendent of the new fossil species *Prodiplodon singewaldi*. It appears to be the only *Diplodon*-like species living in the region near the localities in which the fossils were found. True *Diplodon* is most plentiful in the La Plata system and in southeastern Brazil. It occurs also in Chile and eastern Brazil, a couple of species in Guiana, and a couple in Patagonia. The abundance of *Diplodon*, evidently a descendent of *Prodiplodon*, in the La Plata system is interesting when considered in connection with *Erodona* (apparently descended from *Anisothyris*, the most plentiful fossil in the deposits under consideration) which is found in the brackish waters of the La Plata estuary.

PRODIPLODON SINGEWALDI, new species

Plate 1, figs. 3, 6

Shell rather compressed, somewhat quadrate in form, rounded in front, slopingly truncated at the rear. Ventral margin a little curved in its median portion, sweepingly rounding into the anterior margin and making a broad angle with the posterior margin. Dorsal margin arched, making a very broad, scarcely noticeable, angle with the posterior margin. Beaks well forward, about 19 mm. behind the extreme anterior end and 51 mm. in front of the extreme posterior end. Posterior ridge low, slightly angulated at upper part of shell, anterior ridge almost entirely lacking. Sculpture of very prominent concentric lines marking rest periods, with minor concentric striae between them. Umbonal area sharply and closely sculptured with ra-

² Journ. de Conch., vol. 8, p. 353, pl. 13, fig. 6, 1868.

³ Descriptive Cat. Nalades, p. 1273, 1914.

diating threads or riblets. Those at the anterior portion are narrow, curved, somewhat granulous and do not rapidly increase in thickness. Those at the posterior end are also curved but increase rapidly in size. In the middle portion the threads join into several V's with nearly straight sides. The curved threads of the front and rear portions if continued would form V's with curving sides. Some of the sculpture shows a tendency to continue into the next area after the distinct umbonal period was passed; at the anterior end this tendency shows itself in several direct but rather obscure threads which continue across the next growth area. Pseudocardinal teeth plate-like, nearly parallel to the dorsal margin and close to the tip of the beak. Lateral tooth long and curved.

The type (Cat. No. 370808, U. S. N. M.) measures: Length, 70 mm.; height, 39 mm.; diameter, if both valves were present, would be about 20 mm. A paratype forms Cat. No. 370809, and a paratype was returned to Professor Singewald. They came from Paucarpata, on the Marañon River, and were collected by Dr. Joseph T. Singewald, jr., in whose honor the species has been named. The most striking feature of this species is the neat, clean-cut character of the umbonal sculpture. The species is related to *Prodiplodon paucarpatis* described in this paper, but is less elongate and somewhat more nasute. It is related also to *Prodiplodon bassleri* Marshall which, however, has an elliptic outline and the beak sculpture pointing differently. The three species form a very natural group.

PRODIPLODON BASSLERI, new species

Plate 1, fig. 1

Shell moderately thin, rather compressed, elliptic, slightly narrower in front. Ventral margin regularly curved, rounding regularly into the posterior margin, and apparently into the anterior margin also. Posterior ridge low and rounded. Anterior ridge not differentiated from the general surface. Beak set well forward, about 10 mm. behind the anterior margin, and 50 mm. in front of the posterior margin. Sculpture of fairly well-marked concentric striae and lines showing rest periods—the earlier ones set obliquely across the general surface of the shell. Sculpture of umbonal area somewhat obscured but evidently similar to that of *Prodiplodon singewaldi* but the points of the V's pointing in the general direction of the postero-ventral margin, while in *Prodiplodon singewaldi* they are directed toward a point anterior to the middle of the ventral margin. Pseudocardinal teeth placed directly under the tip of the beak. Anterior adductor scar very deep, posterior scar nearly superficial. Pallial line at rear end about 10 mm. from the ventral margin.

The type, (Cat. No. 370811, U.S.N.M.) measures: Length, 60 mm.; height, about 38 mm.; diameter, if both valves were present, would be about 16 mm. It was collected at Pebas, Peru, by Dr. Harvey Bassler in whose honor the species is named. Related to *Prodiplodon singewaldi* described in this paper, from which it differs in having the outline elliptic instead of quadrate. It groups also with *Prodiplodon paucarpatus*.

PRODIPLODON PAUCARPATENSIS, new species

Plate 1, fig. 4

Shell compressed, elongate trapezoidal, slightly narrower in front, slopingly truncated at the rear. Dorsal margin nearly straight, ventral margin nearly straight, rounding into the anterior margin, joining the posterior margin at an angle. Beaks well forward, about 18 mm. from extreme anterior end, 56 mm. from extreme posterior end. Descent from beaks to anterior margin rather abrupt. Posterior ridge low and rounded. Posterior dorsal area long and broad. Sculpture of well-marked concentric lines of growth. Umbonal portion of shell with sculpture evidently similar in general pattern to that of *Diplodon singewaldi* described in this paper, but weathered, so that details can not be pointed out. The whole shell lacks its outer surface and is nearly white.

The type (Cat. No. 370810, U.S.N.M.) measures: Length, 74 mm.; height, 39 mm.; diameter, 18 mm. It comes from Paucarpata, on the Marañon River, and was collected by Dr. Joseph T. Singewald, jr., of Johns Hopkins University. This species has the form common to the well-known *Unio complanatus* of the United States. It is related to *Prodiplodon singewaldi* Marshall, but differs in form, being more elongate and less oblique. It is related also but not so closely to *Prodiplodon bassleri*.

EODIPLODON, new genus

Beaks with very coarse, nearly direct radial undulation, some of which are broken up into nodules. Close to the tip of the beak each pair of undulations unites into a V but the later ones become nearly direct and do not form a V.

Type of the genus, *Eodiplodon gardnerae* Marshall, described below. This genus also is related to the recent genus *Diplodon*.

EODIPLODON GARDNERAE, new species

Plate 1, figs. 2, 8

Shell rather thin, very elongate, beak set very far forward, about 7 mm. behind extreme anterior margin, 57 mm. in front extreme posterior margin. Dorsal margin somewhat broken but evidently

nearly straight posterior to the beak and sloping downward to the posterior margin. Anterior to the beak the very short dorsal descends rapidly to meet the anterior margin. Ventral margin nearly regularly curved, sweeping into the anterior margin in a broad curve and not differentiated from it. Posteriorly the shell becomes narrower, the ventral margin curving sharply to join the posterior margin, the two margins differentiated from each other by the end of the posterior ridge. Posterior ridge well marked, with an indistinct rib running along its summit. Posterior area with two faint radiating grooves forming a low, broad rib between them. General surface of shell rather smooth, concentric growth lines not well marked except on the posterior area and near the anterior margin. At the anterior end of ventral margin are five short radiating flutings. A faint groove just appreciable to touch and made faintly visible by a dark line extends from the beak to the ventral margin just behind its middle point, probably marking the depth to which the animal inserted itself into the material of the bottom. Interior pearly, anterior adductor scar deep, posterior scar well marked but shallow. Pallial line well marked, about 6 mm. from the ventral margin. Umbonal area very prominent because of the strong radial sculpturing. At the anterior end this sculpture consists of five fine, rather granular, curving sharp threads, the middle area shows a crudely V-shaped arrangement, partly broken up into stout nodules. The posterior portion has several direct radiating threads or riblets.

The type (Cat. No. 370812, U.S.N.M.) measures: Length, 64 mm.; height, about 30 mm.; diameter if both valves were present would be about 16 mm. It was collected by Doctor Singewald at Pebas, Peru, and is named in honor of Dr. Julia A. Gardner, of the United States Geological Survey. Cat. No. 370814 includes a cast, a partially preserved umbonal portion, and a number of fragments, all from the type locality. Several partially preserved specimens were returned to Professor Singewald.

The type, owing to a rich chestnut coloring due to a ferruginous stain, has almost the appearance of a recent shell. The species is not closely related to any known recent species. In boldness and extent of umbonal sculpture it is scarcely equaled by any recent species, and in the breaking up of part of the sculpture into nodules it stands unique.

EODIPLODON PEBASENSIS, new species

Plate 1, figs. 5, 7

Shell apparently rather compressed, thick, rounded in front, obliquely truncated behind. Dorsal margin lightly arched, ventral margin slightly curved, meeting the posterior margin in an obtuse angle, and rounding into the anterior margin. Posterior ridge low

and not well pronounced. Beak set well forward, about 5 mm. from anterior edge and 20 mm. from posterior end. Concentric sculpture of faint growth lines. Umbonal region boldly sculptured with radiating ribs and nodules. The anterior portion has five direct, sharp, faintly granulate radiating threads. The middle portion has the riblets arranged in V pattern and somewhat nodulous. The posterior portion has four sharp, direct slender threads. Pseudocardinal tooth stout.

The type (Cat. No. 370813, U.S.N.M.) is a fragment but includes all the shell up to a well-marked rest period. At that period it measured: Length, 25 mm.; height, 13 mm. It came from Pebas, Peru, and was collected by Dr. Joseph T. Singewald.

In beak sculpture this species resembles and might be mistaken for *Eodiplodon gardnerae*, but careful examination shows marked differences. In form the two species are very different, *Eodiplodon gardnerae* being very elongate, narrow, and rather inflated, while *Eodiplodon pebasensis* is subquadrate, broad, especially at the posterior end, and rather compressed.

ANODONTITES?

Included with the collection sent by Doctor Singewald are some fragments of a very large fossil pearly fresh-water mussel, from Tarapoto, Peru. Cat. No. 370815. There is not enough left to determine the genus, but what we know of the microscopic structure of the South American Naiades leads to the belief that they belong to some genus in the subfamily Mutelinae of the family Mutelidae. The shell must have been very large and massive, as one of the fragments from along the ventral margin has a thickness of about 8 mm., and the pallial line is about 27 mm. from the ventral edge. These measurements are not equaled by any known South American Naiad, recent or fossil. They call to mind the size and massiveness of our largest North American Naiades, namely, the genus *Crenodonta*. The numerous layers of nacreous material, each very thin, between the pallial line and ventral margin indicate that the shell was aged, and that growth at this period was very slow. During this time the pallial line appears to have remained nearly stationary. The prismatic layer is very thick (in some places about a millimeter) indicating a member of the Mutelinae and not the Hyriinae, as in the latter the layer is thin and usually flakes off with the periostracum. In spots the component spicules of the prismatic layer have separated from each other and lie scattered about or in a heap.

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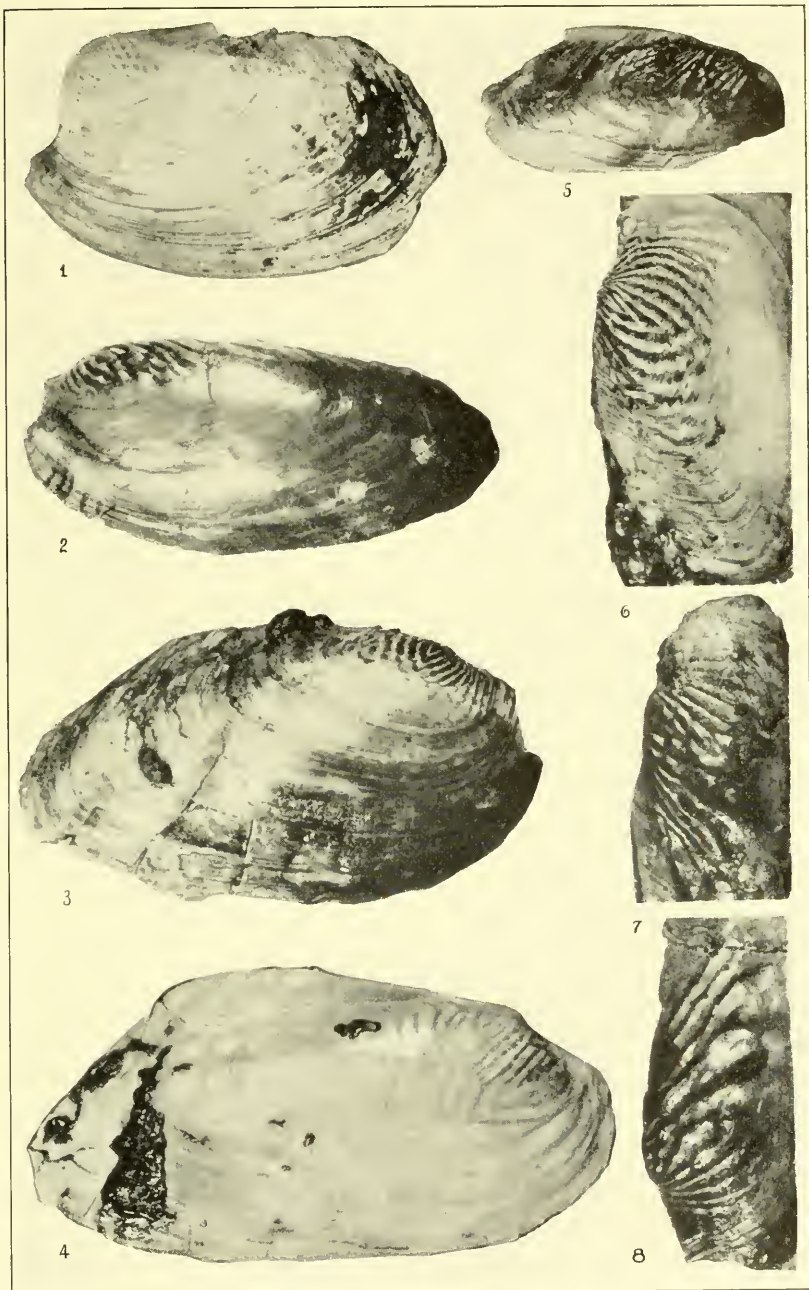
The following list of papers comprises about all that has been published on the formations considered in this paper:

1869. W. M. GABB, Descriptions of fossils from the clay deposits of the Upper Amazon, Amer. Journ. Conch., vol. 4, pp. 197-200, pl. 16.
1871. T. A. CONRAD, Descriptions of new fossil shells of the Upper Amazon, Amer. Journ. Conch., vol. 6, pp. 192-198, pl. 10.
1872. C. F. HARTT, On the Tertiary basin of the Marañon, Amer. Journ. Sci. and Arts, ser. 3, vol. 4, pp. 53-58.
1878. OSKAR BOETTGER, Die Tertiärfauna von Pebas am oberen Marañon, k. k. Reichsanstalt, vol. 28, pp. 485-504, pls. 13 and 14.
1879. C. BARRINGTON BROWN, On the Tertiary deposits on the Solimões and Javary Rivers in Brazil, Quar. Journ. Geol. Soc. London, vol. 35, pp. 77-82.
1879. R. ETHERIDGE, Note on the mollusca collected by C. Barrington Brown from the Tertiary deposits of Solimões and Javary Rivers, Brazil. Quar. Journ. Geol. Soc. London, vol. 35, pp. 82-88, pl. 7. This paper is an appendix to the preceding one.
1921. M. G. DE OLIVEIRA, Breve noticia sobre os fosseis terciarios do Alto Amazonas, Boletim Service geologico e mineralogico do Brasil. No. 11, pp. 41-52, 1 plate.
1927. JULIA GARDNER, A recent collection of late Pliocene invertebrates from the headwaters of the Amazon, Journ. Washington Acad. Sci., vol. 17, no. 20, pp. 505-509.

EXPLANATION OF PLATE

- Fig. 1. *Prodiplodon bassleri*, new species nat. size.
 2. *Eodiplodon gardnerae*, new species nat. size.
 3. *Prodiplodon singewaldi*, new species nat. size.
 4. *Prodiplodon paucarpatisensis*, new species nat. size.
 5. *Eodiplodon pebasensis*, new species nat. size.
 6. *Prodiplodon singewaldi*, new species. Beak sculpture $\times 2$ diameters.
 7. *Eodiplodon pebasensis*, new species. Beak sculpture $\times 2$ diameters.
 8. *Eodiplodon gardnerae*, new species. Beak sculpture $\times 2$ diameters.





NEW FRESH-WATER MUSSELS FROM PERU

FOR EXPLANATION OF PLATE SEE PAGE 7

TWO NEW NEMATODE WORMS FROM RODENTS

By EMMETT W. PRICE

Of the Zoological Division, Bureau of Animal Industry, United States Department of Agriculture

In this paper two nematodes which appear to be new species from rodents are described. The first of these species was collected from the cecum and colon of a flying squirrel, *Glaucomys volans volans*, which was found dead by Miss Florence Thompson, librarian of the Bureau of Animal Industry, at her home at Falls Church, Va., July 28, 1927. This parasite belongs to the family Oxyuridae Cobbold, 1864, subfamily Syphaciinae Railliet, 1916, and genus *Syphacia* Seurat, 1916. For this species the name *Syphacia thompsoni* is proposed.

The second species was collected from the small intestine of a gray squirrel, *Sciurus carolinensis*, which was killed near Bowie, Md., by Dr. Albert Hassall, October 10, 1927. This species belongs to the family Trichostrongylidae Leiper, 1912, subfamily Helimosominae Travassos, 1914, and genus *Heligmostrongylus* Travassos, 1917. For this species the name *Heligmostrongylus hassalli* is proposed.

SYPHACIA THOMPSONI, new species

Specific diagnosis.—*Syphacia*: Slender forms, milk white in color, male much smaller than female, and with the tail of both sexes very long and slender. Cuticula coarsely striated transversely. The mouth is provided with three lips of about equal size. The circumoral papillae and amphids are situated laterally in two groups, each group consisting of two small submedian papillae and a large umbilicated amphid or so-called lateral papilla. (Fig. 1.)

Male 3.1 mm. long and 156 to 160 μ wide. The posterior end of the male is strongly curved ventrally in the form of a hook. (Fig. 2.) The cuticle of the anterior end of the body is inflated and is 78 to 98 μ in diameter and extends from the base of the lips to the level of the cervical papillae. The esophagus is club-shaped, 250 to 280 μ long by 38 μ wide at the narrowest part and increasing to 60 μ at the posterior end. The esophageal bulb is spherical, 76 to 99 μ in diam-

eter, and is joined to the esophagus by a short slender constriction. The nerve ring surrounds the esophagus about 90μ from the anterior end of the body. The excretory pore opens ventrally 75μ caudad of the esophageal bulb. The cervical papillae are situated 172 to 214μ from the anterior end of the body. The lateral alae arise immediately caudad of the cervical papillae and extend to within a short distance from the cloacal aperture. The tail is long and slender, and terminates in a fine point. (Fig. 3.) There are two narrow, symmetrical bursal alae and three pairs of caudal papillae, one pair pre-anal, one pair adanal, and one pair postanal; the postanal papillae are large and pedunculated, and support the caudal alae. The cloacal aperture is situated on a slight prominence 340 to 435μ from the end of the tail. Immediately caudad of the cloacal aperture there is a small rounded prominence which bears six small spikelike projections. The spicule is simple, slightly curved, and 156 to 190μ long by 18μ wide at the base. The gubernaculum is 95 to 110μ long, directed transversely, and is provided at its distal end with a barb-like hook. (Fig. 4.) The ventral surface of the body bears three large, finely striated bosses or mamelons. The most caudad of these prominences lies 250μ in front of the cloacal aperture and is 156 to 187μ long; the second lies 140 to 155μ anterior of the first and is 125 to 155μ long; and the third is 95 to 125μ anterior of the second and is 125 to 140μ long.

Female 11 to 14 mm. long and with a maximum width of 357 to 430μ . The esophagus is 435μ long by 45μ wide at the anterior end and increases to 98μ in width at the posterior end. The esophageal bulb is 117 to 310μ wide. The nerve ring surrounds the esophagus about 120μ from the anterior end of the body. The cephalic dilation is 120 to 170μ wide in outside diameter. The cervical papillae are situated 260 to 280μ from the anterior end of the body. The excretory pore is situated about 470μ caudad of the union of the intestine and esophageal bulb. The lateral alae begin at the cervical papillae and extend to the posterior end of the body. The anus is situated 3 to 4 mm. from the tip of the tail. The vulva is situated 1.6 mm. from the anterior end of the body. (Fig. 5.) In immature specimens the vulva is covered with a brownish colored plaque; in gravid specimens, however, the vagina is protruded. Eggs oval, flattened on one side, and 96 to 98μ long by 28 to 38μ wide.

Host.—*Glaucomys volans volans*.

Location.—Cecum and colon.

Locality.—Falls Church, Va.

Type specimens.—United States National Museum Helminthological Collections No. 27827; paratypes No. 27793.

Symphacia thompsoni resembles *S. obvelata* (Rudolphi, 1802), the type of the genus, in body form and in the number of ventral mame-

lons in the male. It differs, however, in that the former species is about twice the size of the latter, the tail of both sexes is proportionally longer and more slender, the spicule and gubernaculum larger, and the egg smaller. The presence of a spiny process caudad of the cloacal aperture also appears to be characteristic of the new species. This species is readily distinguishable from *S. pallaryi* (Seurat, 1915) by the number of ventral mamelons, there being but two in the latter species.

Yorke and Maplestone (1926) list *S. bonnei* Thiel, 1925, from *Myctes seniculus*, and *S. stossichi* (Setti, 1897) from *Hystrix cristata*, in addition to *S. obvelata* and *S. pallaryi*, as belonging to the genus *Syphacia*. Travassos (1925), however, has shown that *S. bonnei* is identical with *Enterobius minutus* (Schneider, 1866). The inclusion of *S. stossichi* (= *Oxyuris stossichi*) in this genus by Travassos (1923) appears to the writer to be subject to question. The bosses or mamelons figured by Setti (1897) are too small and situated too near the cloacal aperture to be considered comparable to the large mamelons of the other species of the genus; there also appears to be an absence of caudal alae, papillae, and a gubernaculum. On the basis of these differences it is the opinion of the writer that if *S. stossichi* is restudied, it will probably be found to represent a new genus.

HELIGMOSTRONGYLUS HASSALLI, new species

Specific diagnosis.—*Heligmostrongylus*: Small slender worms, reddish in color and loosely coiled when fresh, yellowish and almost straight when preserved in alcohol. Cuticle of the anterior end dilated and coarsely striated transversely. (Fig. 6.) The cuticle of the body is finely striated transversely and is also provided with small striated bosses (fig. 7) arranged in the form of 14 to 16 longitudinal lines. These lines extend from the cephalic dilation to the vulva of the female, and to the bursa of the male. A well-defined ala extends along the left side of the body from the cephalic dilation to the vulva in the female, and to near the bursa in the male. Cervical papillae not observed. The mouth opening is triangular and bears 2 submedian papillae, and one amphid (the lateral papilla of various authors) on each side. (Fig. 8.)

Male 5.3 to 6.8 mm. long by a maximum width of 122μ at the middle of the body. The cephalic expansion is 38μ wide and 75μ long. The esophagus is simple, 290 to 300μ long by 15μ wide at the anterior end and increasing to 40μ in width at the posterior end. The nerve ring surrounds the esophagus about 150μ from the anterior end. The excretory pore is situated immediately caudad of the posterior end of the esophagus. The bursa consists of two large

lateral lobes and a smaller dorsal lobe. The ventro-ventral and latero-ventral rays are widely separated and divergent, the latero-ventral ray being longer than the ventro-ventral and extending to the edge of the bursa; externo-lateral ray slightly thicker than the other rays; medio-lateral ray relatively thick and extending almost to the edge of the bursa; externo-lateral ray short and divergent; externo-dorsal ray slender; dorsal ray cleft almost to the base, forming two branches which in turn give off a lateral branch near the origin of the primary branch. (Fig. 9.) Prebursal papillæ present. The spicules are tubular, pointed, and 385μ long by 16μ wide at the base. Gubernaculum absent. The telamon (fig. 10) is feebly chitinated and elongated; its anterior end pointed and embedded in the ventral wall of the cloaca; the lateral edges are inrolled, forming a tube through which the spicules pass; slightly caudad of the middle of the telamon a slender lateral process is given off which appears to furnish attachment for muscles.

Female 8.4 to 8.6 mm. long and 76μ wide at the vulva. The esophagus is 350μ long by 20μ wide at the anterior end and the width increases to 50μ at the widest portion. The nerve ring is situated 210μ from the anterior end of the body. The tail is short and blunt. (Fig. 11.) The anus is situated about 53μ from the tip of the tail. The uterus is single and is provided at its distal end with a strongly muscular ovejector which measures 220μ in length. The vulva is situated about 180μ from the posterior end of the body. In some specimens a short, thick, ventral process is present immediately in front of the vulva. Egg 76μ long by 45μ wide, oval in shape and provided with a thin shell.

Host.—*Sciurus carolinensis*.

Location.—Small intestine.

Locality.—Bowie, Maryland.

Type specimens.—United States National Museum Helminthological Collections No. 27853; paratypes No. 27860.

This species differs from *Heligmostrongylus sedecimradiatus* (Linstow 1899) in its smaller size, shorter spicules and dorsal ray. The dorsal ray in *H. hassalli* is not cleft entirely to the base and the lateral branches arise near the bifurcation. In *H. sedecimradiatus* the dorsal ray is cleft entirely to its base forming a double dorsal ray, and the lateral branches are given off about the middle of the primary branches. Travassos (1921) says that a gubernaculum is present in *S. sedecimradiatus*, but from his figure of the bursa of this species the shape and position of this structure suggest that it functions as a telamon and that a gubernaculum is absent.

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EXPLANATION OF PLATES

<i>a</i> =anus.	<i>oesb</i> =esophageal bulb.
<i>e pp</i> =excretory pore.	<i>ovj</i> =ovjector.
<i>int</i> =intestine.	<i>ut</i> =uterus.
<i>la</i> =lateral ala.	<i>vag</i> =vagina.
<i>nr</i> =nerve ring.	<i>vul</i> =vulva.
<i>oes</i> =esophagus.	

PLATE 1

Syphacia thompsoni, new species

FIG. 1. Head, end face view.

2. Adult male, entire.

3. Male, posterior end.

4. Spicule and gubernaculum.

5. Female, anterior end.

PLATE 2

Heligmostrongylus hassalli, new species

FIG. 6. Female, anterior end.

7. Cuticular bosses; greatly enlarged.

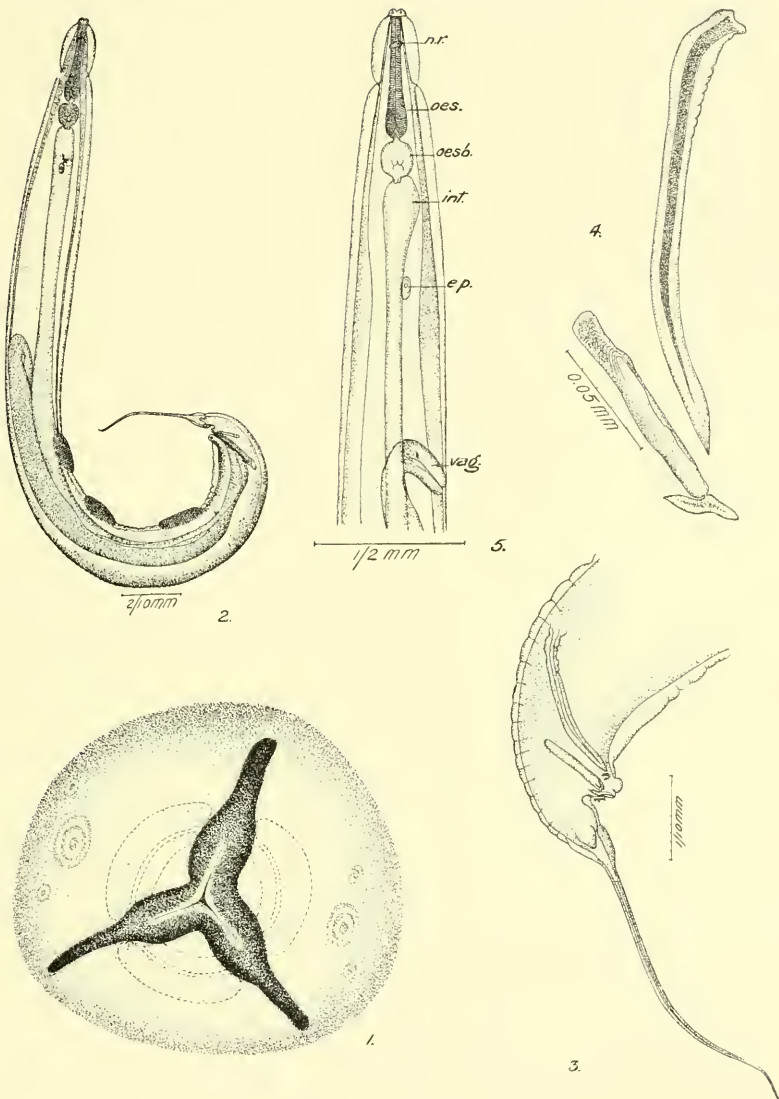
8. Head, end face view.

9. Bursa, dorsal view.

10. Telamon, ventral view; greatly enlarged.

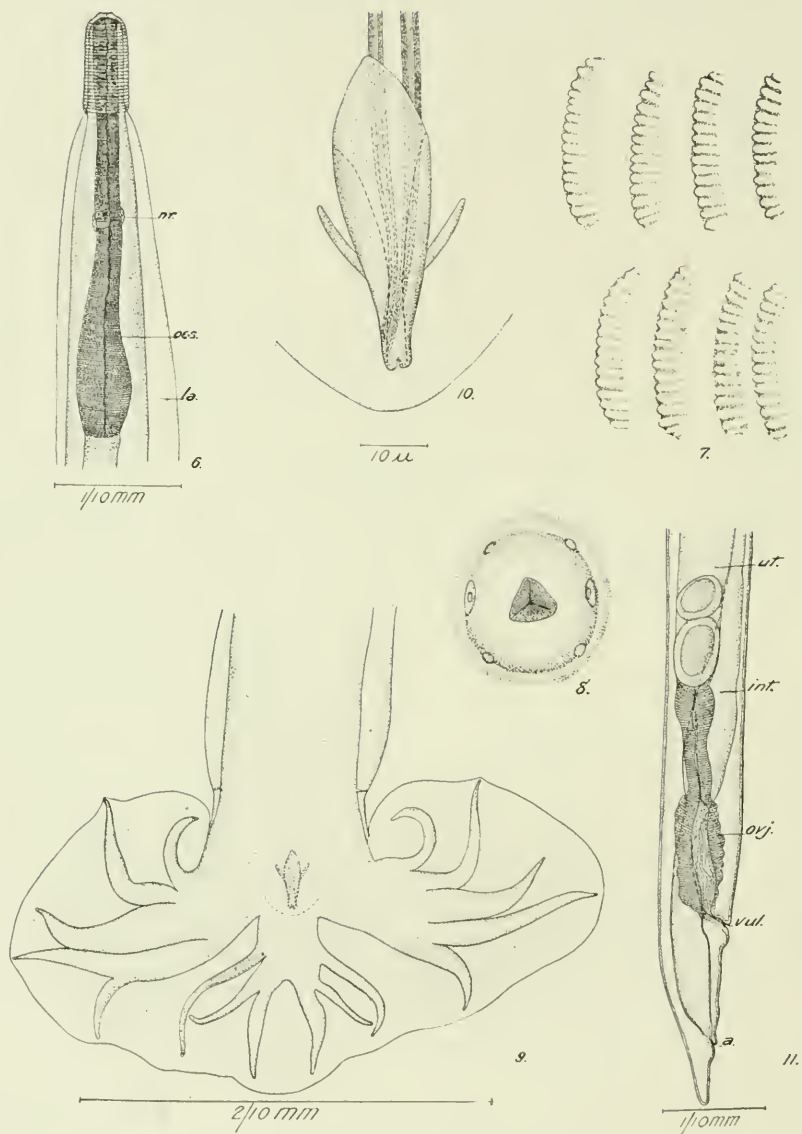
11. Female, posterior extremity.





SYPHACIA THOMPSONI, NEW SPECIES

FOR EXPLANATION OF PLATE SEE PAGE 5



HELIGMOSTRONGYLUS HASSALLI, NEW SPECIES

FOR EXPLANATION OF PLATE SEE PAGE 5

FOSSIL FOOTPRINTS FROM THE FORT UNION (PALEOCENE) OF MONTANA

By CHARLES W. GILMORE

Curator of Vertebrate Paleontology, United States National Museum

INTRODUCTION

In 1908 Mr. A. C. Siberling, while collecting mammalian fossils for the United States National Museum in the Fort Union deposits of south-central Montana, also discovered a series of fossil footprints in this same formation.

Apparently these were the first fossil tracks to be discovered in the Paleocene, and as such they appear worthy of record. Recently a series of fossil tracks found in deposits of equivalent age in the Province of Alberta, Canada, have been described by Messrs. Rutherford and Russell,¹ but these tracks are thought to be mammalian in origin, and although their details are somewhat obscurely preserved their tridactyle nature effectually distinguishes them from the tracks here considered.

Originally the Montana tracks were preserved as one large slab, but owing to the vicissitudes of transport this specimen was broken into many pieces and the loss of connecting edges made it impossible to reassemble them in their original relationships. The specimen is now in three slabs, as shown in the accompanying plates.

The tracks are impressed on the slightly undulating surface of a fine grained sandstone that in some instances has preserved the full details of the feet in addition to recording dragging tails, claw scratches, and belly impressions. Due to the breakage of the original slab, only short sections of trackways are now available. The best one at hand, shown in Plate 1, is selected as the type.

AMMOBATRACHUS MONTANENSIS, new species

Plates 1, 2, and 3

Type.—Cat. No. 7635, U.S.N.M., parts of trackways on three slabs that originally formed one large slab. Collected by A. C. Silberling, 1908.

Type locality.—Section 8, range 16, township 5, Bear Butte, Bear Butte Pass, Sweetgrass County, Mont.

Geological horizon.—"Silberling's Fort Union No. 3." Paleocene.

¹ Rutherford, R. L. and Russell, L. S., Amer. Journ. Sci., vol. 15, 1928, p. 262.

The series of tracks selected as being typical of the above-named species is shown on the lower two thirds of the slab illustrated in Plate 1. With the exception of four faint impressions shown on the bottom of Plate 2, all other tracks on the three slabs illustrated in Plates 1, 2, and 3 are regarded as pertaining to the present genus and species.

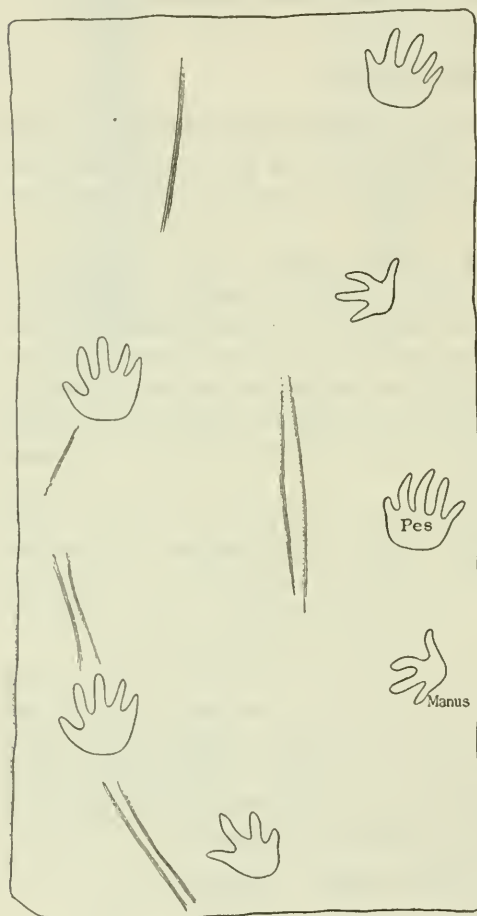


FIG. 1.—AMMOBATRACHUS MONTANENSIS, TYPE NO. 7635 U. S. N. M. DIAGRAM OF TRACKWAY. ABOUT ONE-THIRD NATURAL SIZE

Description.—Stride variable, measuring from 135 to 180 mm.; width of trackway measured from the outside of one foot to a corresponding position on the opposite side, about 162 mm. The manus tracks irregularly placed but usually forward of midway between those made by the hind feet. Fore slightly smaller than hind foot.

Manus.—Tetradactyle, plantigrade, rounded palm, and diverging digits. Length over all, 22 mm.; distance between tips of lateral toes 31 mm.; breadth of palm, 20 mm. Outer toe originates well backward on the side of the palm and is strongly diverted outward away from the three inner toes. The manus as a whole turns strongly inward toward the median line of the trackway. Inner toe shorter than fourth digit. Third longest.

Pes.—Pentadactyle, plantigrade. Sole broadly

rounded behind. Length over all, 33 mm.; distance between tips of lateral toes, 33.5 mm.; breadth of sole, about 28 mm. First digit short and originating well back on the side of the sole; divergence slightly less than 45°. Three median toes long, relatively slender, with subacute or rounded terminations. There is some variation in the relative lengths of the digits of opposite feet as is clearly indicated in Figure 1. None of the tracks give clear indication of the presence of

sharp claws although deep scratches are recorded by the toes especially of the pes where they dragged with each step. These are clearly indicated on the left side of the trackway shown in Plate 1. In this same section of trackway a smoothing out of the surface between the two lines of tracks suggest a belly drag leading to the inference that the animal was a low, wide-bodied, short-legged quadruped. The presence of a heavy tail is clearly indicated by an intermittent but deep median groove.

The digital formula of four and five toes, respectively, on manus and pes, a close similarity in arrangement and in the relative lengths of the digits, these tracks have their closest affinities with *Ammobatrachus turbatans* Gilmore recently described² from the Supai formation (?Pennsylvanian) of the Grand Canyon. Their specific distinctness, however, is at once indicated by the much greater width of the trackway, longer stride, and more open spacing of the fore and hind foot impressions. The larger foot measurements of *A. turbatans* suggests a bigger animal than the one making the tracks considered here, which accentuates the importance of the differences enumerated.

Comparison of the pes tracks shows the Montana ichnite to have relatively longer and more slender digits with a more strongly divergent digit five. Contrasting the manus tracks the sole of Cat. No. 7635, U. S. N. M., is shorter, the lateral digits relatively longer, and the angulation of the imprint with toes directed strongly inward toward the center of the trackway, at once distinguishes these imprints from the forwardly pointed toes of *A. turbatans*.

The digital formula strongly suggests this new species to be of amphibian lineage, but in the absence of confirmatory evidence there seems no way of definitely determining this point. Neither does a review of the known fauna of this formation give any hint as to the class or the kind of animal to which these tracks might be attributed. There are no amphibians known from the Fort Union and the only reptiles are small lizards, turtles, crocodiles, and the Rhynchocephalian *Champsosaurus*. The two last mentioned with their elongated toes of the hind feet would be at once ruled out, though there is the possibility of their being Chelonian in origin.

² Smith. Misc. Coll., vol. 80, 1928, No. 2956, p. 8, pl. 2.

EXPLANATION OF PLATES

PLATE 1

Ammobatrachus montanensis, new species. No. 7635 U.S.N.M. type. Trackway on lower half of slab shows toe scratches, belly drag and tail grooves. About one-third natural size.

PLATE 2

Ammobatrachus montanensis, No. 7635 U.S.N.M. Part of type slab. Various imprints of feet. Tracks crossing the slab diagonally at the bottom pertain to some other animal. About one-third natural size.

PLATE 3

Ammobatrachus montanensis, No. 7635 U.S.N.M. Part of type slab. Various imprints of feet with distinct tail drag. About natural size.



TYPE SLAB OF AMMOBATRACHUS MONTANENSIS

FOR DESCRIPTION OF PLATE SEE PAGE 4



PART OF TYPE SLAB OF AMMOBATRACHUS MONTANENSIS

FOR DESCRIPTION OF PLATE SEE PAGE 4



PART OF TYPE SLAB OF AMMOBATRACHUS MONTANENSIS

FOR DESCRIPTION OF PLATE SEE PAGE 4

NOTES ON SOME ORIENTAL SAPROMYZID FLIES (DIP- TERA), WITH PARTICULAR REFERENCE TO THE PHILIPPINE SPECIES

By J. R. MALLOCH

Of the Biological Survey, United States Department of Agriculture

For many years I have taken a great interest in the family Sapromyzidæ, collecting the species assiduously in Scotland, where they occur in great numbers, and during the past decade I have devoted much time to a consideration of the generic groupings. Recently I published several papers on the American and Australian forms, and at my request Dr. J. C. H. de Meijere has submitted for examination types or paratypes of most of his Oriental species,¹ along with specimens of a number of other species from the same region described by different authors. This material, coupled with a large collection from Formosa sent to me by Dr. Walther Horn, has enabled me to arrive at a definite conclusion as to the generic positions of these species and the specific identities of many Philippine species submitted to me for identification by the late Prof. C. F. Baker.

The work on the genera of the family by Dr. F. Hendel² appeared at a time when generic concepts in the group were much broader than they are to-day, a fact clearly shown by the acceptance then of but 22 valid genera, as compared with 76 in the same author's generic synopsis published in 1925. Unfortunately the broad concepts laid down in 1908 have influenced most workers on the family so that species have been described in the genus *Lauxania* which have very little in common with the genotype. While I do not favor the erection of a large number of monobasic or poorly represented genera in any group, I feel that a careful consideration of structural characters by a competent taxonomist ought to result in a well ordered segregation of related forms in genera, or subgenera, the distribution of which throughout the various faunal regions can not fail to be of interest and value in affording data upon the relationships and

¹ For list, see Tijds. Ento., vol. 60, 1918, p. 345.

² Genera Insectorum, fasc. 68, 1908.

origin of these groups, and their connections with others found in the same faunal regions. In other words, I consider that a genus should contain closely related forms, how close being a matter for decision by a number of competent workers, and not a heterogenous collection of diverse forms, so that the occurrence of a species of such genus will have more significance than where a member of a heterogenous concept occurs.

The most comprehensive paper on Philippine Sapromyzidae is that by Dr. R. Frey which appeared in 1927.³ It contains records of 54 species, 27 of them new to science. I have gone carefully over this paper and have succeeded in identifying a number of the species in the material in my possession, but several are yet unknown to me. In the present paper I indicate certain synonyms as the result of Doctor Frey's work and also relocate some of his species. The genera unknown to me are briefly discussed also.

While all of the systematic entomological work on Philippine species has up to the present been done by European and American workers, it is certain that in the near future some capable Philippine students will undertake this work; and in the present paper I have attempted to utilize the most dependable characters for the separation of the species so that even without access to type specimens it may be possible for a careful and efficient worker to confidently identify those included in this paper.

The reason for introducing so many extralimital species in the key is that, though as yet unrecorded from the Philippines, it is not at all certain that many of them do not occur there, because the collecting that has been done has been by no means intensive, and the fact that about twice as many species are known from the Nederland Indies as are recorded from the Philippines appears to me a safe premise from which to deduce that many more Philippine species have yet to be discovered, and probably many of these will be identical with species occurring in adjacent or even distant islands in the same region.

The figures of the male hypopigia are presented as the most dependable specific indices, and this series is the most extensive ever published for this family.

The original intention was to publish this paper in the Philippine Journal of Science, but this plan was changed by the death of Prof. C. F. Baker and the acquisition of his collection by the United States National Museum. To make the collection as complete as possible, I waive any claim to the type specimens of the Philippine species collected by Professor Baker and deposit them in the National Collection.

³ Acta Soc. Faun. Flor. Fennica, vol. 56, No. 8, pp. 44.

Subfamily CELYPHINAE

This group has usually been given distinct family rank, but I consider it is merely a subfamily of Sapromyzidae, distinguished by the very large convex scutellum, which usually covers the entire abdomen and gives the insects a beetle-like appearance, and is with one exception without marginal or discal bristles. With the discovery of the new genus *Idiocelyphus* described herein the claim to family distinction of the group is very much weakened as in it the scutellum is very much smaller than usual and it has four well-developed bristles. Many of the species are metallic blue or violet colored, quite distinct from any in the other subfamily, but some are almost entirely testaceous, a color predominating in the Sapromyzinae. I have recently briefly discussed the family characters in "Entomologische Mitteilungen" (1927, page 160), but did not at that time have access to the new genus above mentioned. In addition to the characters mentioned in that paper it appears worth noting that while there are no distinct bristles on the frontal field there are four very fine minute hairs which appear to me to represent the two pairs of orbital bristles usually present in Sapromyzinae. One of these pairs of fine hairs is situated near the margin on upper half and represents the upper pair of orbitals, while the other is near anterior margin and each hair is about as far from eye as from each other and incurved. In this subfamily we find also the only case where the cross vein separating the discal and posterior basal cells of the wings is absent in Sapromyzidae, but it is not invariably so in the group, being confined to three species previously placed in *Spaniocelyphus* and the single species of *Idiocelyphus*. The presence or absence of this cross vein has been utilized as a generic character in related families and is generally considered as of considerable importance in classification so I have deemed it proper to separate the three species first above mentioned from the typical forms of *Spaniocelyphus*.

The five genera at present known to me may be distinguished as below.

KEY TO THE GENERA

1. A distinct cross vein separating the discal and posterior basal cells of wing 2.
 No cross vein separating discal and posterior basal cells of wings..... 4.
2. Arista very slightly widened at base, the widest portion not more than one-fourth as wide as third antennal segment; vertex rounded; postvertical bristles absent..... *Paracelyphus* Bigot.
- Arista very conspicuously widened on more than its basal half, leaf-like, its greatest width almost, or quite, as great as that of third antennal segment..... 3.

3. Vertex rounded, postvertical bristles absent or microscopic.

Celyphus Dalmann.

Vertex sharply carinate above and slightly raised behind ocelli; postvertical bristles usually represented by microscopic hairs— **Spaniocelyphus** Hendel.

4. Scutellum much longer than thorax, and without bristles; mesonotum without central bristles and the margin with but two, which are confined to the postsutural section----- **Acelyphus**, new genus.

Scutellum not longer than thorax, with two bristles on disk near base and two on margin near apex; mesonotum with several pairs of dorsocentral and one pair of acrostichal bristles in front of scutellum, the humeral and notopleural bristles also present----- **Idiocelyphus**, new genus.

ACELYPHUS, new genus

Generic characters.—Most closely related to *Spaniocelyphus*, distinguished from it by the presence of a well-developed pair of postvertical bristles, the lack of a cross vein separating the discal and posterior basal cells of wing, and the much broader abdomen, which has the tergites evenly rounded over sides and without a slight suture about at the part where they curve over. In *Spaniocelyphus* there is a rather evident suture on each side of each tergite which divide it into three almost equal portions.

Genotype.—*Acelyphus politus*, new species.

There are but three species known to me, which may be distinguished as below.

KEY TO THE SPECIES

1. Entire disk of scutellum and mesonotum with dense erect microscopic pile; length of scutellum not over 1.5 as long as its greatest width; hypopygium as Figures 5 and 6----- **stigmaticus** (Hendel).
Scutellum without dense erect microscopic pile, its length distinctly over 1.5 as long as its greatest width----- 2.
2. Scutellum smooth except for the widely separated piliferous depressions; hypopygium as in Figures 9 and 10; mesonotum without microscopic erect pile except on extreme anterior margin----- **politus**, new species.
Scutellum with regular close stipplelike punctures in addition to the piliferous depressions; mesonotum with dense erect microscopic pile on entire surface----- **repletus**, new species.

ACELYPHUS POLITUS, new species

Male and female.—Prevailing color tawny yellow, deeply overlaid with metallic violet-blue. Legs tawny yellow. Apices of palpi deep black.

Frons about 1.5 as wide as long, the vertex not very sharply carinate, almost rounded except just behind the ocelli and near each eye, the two pairs of verticals and the postverticals well developed; flattened part of the arista fully twice as long as the apical hairlike parts; palpi much dilated at apices, spoon shaped. Scutellum without pronounced punctures, with almost imperceptible

shallow depressions at bases of the very fine sparse hairs which occur over the entire surface. Hypopygium as Figures 9 and 10. Inner cross vein of wing a little beyond middle of discal cell; marginal cell not as wide as submarginal at apex, the second vein not very abruptly bent forward at apex.

Length, 4 mm.

Type.—Male, *allotype*, and 14 *paratypes*, Mount Maquiling, Luzon (C. F. Baker).

Type.—Cat. No. 41084, U.S.N.M.

Two of the *paratypes* are immature and appear to the naked eye almost uniform fulvous in color, but there is a very evident violet-blue tinge on the scutellum when they are viewed from behind.

ACELYPHUS REPLETUS, new species

Male and female.—A darker species than the preceding one, more purplish than violet blue, with the same colored palpi.

Head similar to *politus*. A very striking character apart from the double punctuation of the scutellum, is the presence of dense erect microscopic pile on the mesonotum. Similar pile occurs on the mesonotum and entire scutellum of *stigmaticus*, but there is no indication of such pile on the scutellum, and only a vestige of it on the extreme anterior margin of mesonotum, in *politus*. Inner cross vein beyond middle of discal cell; second vein rather abruptly bent forward at apex.

Length, 4 mm.

Type.—Female, Wai Lima, Sumatra, 1912 (Karny and Siebers), in author's collection; *allotype*, male, and three *paratypes*, Singapore, Straits Settlements (C. F. Baker), in United States National Museum.

Allotype.—Male, Cat. No. 41087, U.S.N.M.

There is a possibility, but no certainty, that some of the smaller species of this group described as belonging to *Celyphus* may be referable here.

ACELYPHUS STIGMATICUS (Hendel)

Spaniocelyphus stigmaticus HENDEL, Suppl. Ent., No. 3, 1914, p. 93.

This species has occurred only in Formosa up to the present, but it may be found in other sections of the Orient. It was described when the genus *Spaniocelyphus* was erected, but *scutatus* Wiedemann was selected as the genotype.

IDIOCELYPHUS, new genus

General characters.—Head similar to that of *Spaniocelyphus*, the vertex rather sharp, with four bristles and a pair of small, but distinct, postverticals; ocellars lacking; antennae as in *Spaniocelyphus*;

clypeus projecting more than in the other genera, angular in profile. Thorax with one pair of quite well developed prescutellar dorso-centrals, and from one to three much shorter pairs in front of them, becoming progressively shorter anteriorly; the other bristles consist of: 1 humeral, 2 notopleurals, 1 supra-alar, 2 postalars, one pair of prescutellar acrostichals, and one mesopleural; scutellum not longer than thorax on dorsum, gradually widened from base to middle, from there slightly narrowed, and broadly rounded at apex; basal bristles situated on disk, separated by about one-third of the width of scutellum, and not over one-fourth from base, the apical pair situated on extreme edge about one-third from apex, and upwardly directed. Legs as in the other genera, but the hind tibia has a strong, black, slightly curved, apical ventral spur which is almost as long as hind metatarsus. Wings as in the other genera, the discal cell not separated from basal cell by a cross vein.

Genotype.—The following species.

IDIOCELYPHUS BAKERI, new species

Shining brownish testaceous; clypeus violet-blue in front; dorsum of head and thorax with a violet tinge, the abdomen more bluish; all bristles black. Palpi with their apices narrowly black. Wings yellowish hyaline. Halteres yellow.

Frons smooth, subquadrate, with a pair of fine convergent hairs close to middle of disk; basal segment of antennae a little longer than second, bare below, third slightly tapered apically, about 1.5 as long as first and second combined; basal wide portion of arista not as wide as third antennal segment and a little longer than it and also than apical hair-like portion; cheek higher than width of third antennal segment; palpi not dilated. Thorax smooth on dorsum, with fine black hairs on mesonotum; scutellum smooth, without hairs, but with dense microscopic pile which is present also on thorax. Fore femur with two or three posteroventral bristles.

Length, 3.5 mm.

Type and three *paratypes*, Mount Maquilang, Luzon, P. I. (C. F. Baker).

Named in honor of the collector.

Type.—Male, Cat. No. 41073, U.S.N.M.

This genus supplies a connecting link between the Celyphinae and Sapromyzinae, the small size of the scutellum, and the presence of scutellar bristles, showing an approach to some genera in the latter subfamily. No other species in Celyphinae has scutellar bristles.

Genus PARCELYPHUS Bigot

I have before me two species of this genus, one of which appears to be undescribed. They may be distinguished as below.

KEY TO THE SPECIES

1. Metallic dark blue species, with decided violet tinge, legs black, bases of tarsi yellow; scutellum with a shallow furrow on each side at base in addition to the one along marginal rim, the surface elsewhere smooth; posterior notopleural bristle present----- *sumatrensis* van der Wulp.
 Testaceous yellow species, the legs concolorous, scutellum with an almost imperceptible bluish tinge, without furrow at base except the marginal one, its surface irregularly rugose, or coarsely wrinkled; posterior notopleural bristle absent----- *testaceus*, new species.

PARACELYPHUS SUMATRENSIS van der Wulp

Paracelyphus sumatrensis VAN DER WULP, Compt. rend. Soc. Ent. Belg., p. 297, 1884.

This species must be very similar to *hyacinthus* Bigot, differing mainly in the color of the antennae, which are entirely black as against the yellow color of those of *hyacinthus*, though the third segment in the latter is brownish or fuscous.

Length, 6 mm.

Locality, Wai Lima, Sumatra, 1921 (Karny and Siebers).

PARACELYPHUS TESTACEUS, new species

This species is about the same size and build as the preceding one, but is readily distinguished by the general testaceous color, even the antennae and legs being pale. While the pale metatarsi of *sumatrensis* are distinctly thickened they are not at all thickened in *testaceus*. Other characters as in the key.

Length, 6 mm, width 4 mm.

Type, Mount Maquilang, Luzon (C. F. Baker); *paratypes*, one, Manila, (G. Compere); four, Tanglecolan, Bukidnon; two, Butuan, Mindanao; one Mount Banahao; one, Davao, Mindanao; one, Samar Island; all in the Philippines (C. F. Baker).

Type.—Cat. No. 41087, U.S.N.M.

The first mentioned paratype has a label on it bearing the notation 'This is always to be noticed round orange or lemon trees. Compere.'

Genus CELYPHUS Dalmann

Until recently all the species of the subfamily except those assigned to the preceding genus were located in *Celyphus*, but a few years ago Hendel proposed the removal of certain species to the new genus *Spaniocelyphus*, and this division is adopted herein as indicated in the generic key. It is not possible, however, to definitely decide the generic position of some of the previously described species. Those I now have before me, or can definitely locate, are included

in the keys given herein. All the material in the Baker collection, now a part of the collections of the United States National Museum, has been used in connection with this paper.

KEY TO THE SPECIES

1. Frons with only the outer, outwardly curved, vertical bristles present, and these very weak; thickened part of arista about 1.5 as long as third antennal segment, the apical hairlike portion about one-third as long as the wide portion; head and thorax fulvous yellow, scutellum violet-blue, slightly wrinkled on sides..... *bisetosus*, new species.
Frons with four quite strong and distinct vertical bristles; the wide part of arista but little longer than third antennal segment, the apical hair-like part fully half as long as the wide part; scutellum distinctly wrinkled on most of its surface..... 2.
2. Face with a black mark between each antenna and eye..... 3.
Face without a black mark between each antenna and eye..... 4.
3. Both thorax and abdomen fulvous yellow, with distinct violet tinge; apical portion of arista not as long as the wide basal part, the latter not as wide as third antennal segment..... *puncticeps*, new species.
Thorax fulvous yellow, with slight violet or blue tinge, the scutellum entirely metallic blue; apical part of arista at least as long as the wide basal part, the latter as wide as third antennal segment..... *aurora* Karsch.
4. Species entirely testaceous in color, no conspicuous blue tinge present; cheek with a blue mark below eye..... *difficilis* Malloch.
Thorax fulvous, with a distinct blue tinge, scutellum metallic blue.
obtectus Dalmann.

CELYPHUS PUNCTICEPS, new species

Male and female.—Testaceous yellow, with a very pronounced violet-blue tinge on entire dorsum; the face with a deep black spot between each antenna and eye.

Structurally similar to *obtectus*, but the arista narrower at base. Scutellum irregularly punctured basally as in *obtectus*.

Length, 5 mm.

Type, male, *allotype*, and two *paratypes*, Singapore, Straits Settlements; *paratypes*, one, Penang; two, Porto Princess, Palawan (C. F. Baker).

Type.—Cat. No. 41083, U.S.N.M.

This species appears to be close to *karschi* Bigot, but without an examination of the type specimens it is impossible to be certain of most of the species described by the older authors.

CELYPHUS BISETOSUS, new species

Female.—Head and thorax shining fulvous yellow, with a faint bluish tinge; scutellum dark metallic violet-blue; abdomen dark castaneous above, yellow below. Antennae fulvous yellow; palpi yellow at bases, deep black on the apical broadened portions. Legs fulvous yellow, femora darker, fore pair brown. Wings yellowish hyaline. Halteres dull yellow.

Vertex with a small outwardly curved bristle close to upper angle of each eye; antennae about as long as width of frons, basal segment slender, and about twice as long as second, third a little longer than first, as wide as, and about two-thirds as long as, the broad part of arista, the hairlike portion of latter but little longer than second antennal segment; cheek about half as high as eye; palpi much broadened, leaflike, at apices. Thorax smooth. Scutellum wrinkled at base. Legs normal.

Length, 5.75 mm.

Type.—Cotschin, India. (In author's collection.)

CELYPHUS DIFFICILIS Malloch

Celyphus difficilis MALLOCH, Ent. Mitt., vol. 16, p. 161, 1927.

This species was described in the paper of mine already referred to herein, and is known only from Formosa.

CELYPHUS AURORA Karsch

Celyphus aurora KARSCH, Berlin, Ent. Zeitschr., vol. 28, p. 173, 1883.

This species is brownish testaceous, with a conspicuous metallic blue sheen on face and frons, all of dorsum of thorax and scutellum, most pronounced on latter. The most noticeable character for distinguishing the species is the deep black mark on each side of face between antenna and eye. The arista is as broad on basal portion as width of third antennal segment and the apical hairlike portion is as long as it and quite long haired. The frons in the specimen before me is not depressed, but almost even and rounded on vertical margin, and the four vertical bristles are well developed. The abdomen and fore femora are testaceous. The scutellum is wrinkled on basal half only.

Length, 5.5 mm.

Locality, Langkat, Sumatra (Deut. Ent. Inst.).

CELYPHUS OBTECTUS Dalmann

Celyphus obtectus DALMANN, Anal. Ent., p. 32, 1823.

This species is very similar to the preceding one, but the head and thorax are more pronouncedly yellow testaceous and less tinged with blue, the scutellum is deeper blue and there are no dark spots on face. The frons is slightly depressed at vertex and the arista is different in structure, as stated in the key.

Length, 4.5 mm.

Locality, Ceylon (Dr. W. Horn).

Genus SPANIOCELYPHUS Hendel

This genus is limited in this paper to those species which have a sharp vertex without well-developed postvertical bristles, and the discal and posterior basal cells of wing separated by a distinct cross vein. In addition to these characters all species available to me have the palpi much less dilated at apices than have the species of *Acelyphus*, and there is a pseudosuture on each side of each abdominal tergite which divides the surface into three almost equal portions and causes them to bend rather sharply over, almost angularly so, in sharp contradistinction to those of *Acelyphus*. The frons is also shorter than it is in *Acelyphus*.

There appear to be five species in the material before me only three of which I consider are already described, though it is possible some of the others are among those so imperfectly described by some of the older authors that they can not be reliably identified.

Genotype.—*Celyphus scutatus* Wiedemann.

KEY TO THE SPECIES

1. Scutellum shallowly and coarsely pitted on almost the entire surface, only the apex smooth----- 2.
Scutellum entirely smooth or with but faint traces of shallow pitting basally----- 3.
2. Apical section of superior foreceps of male hypopygium long, tapering to tip (figs. 1 and 2); Philippine species----- *scutatus* Wiedemann.
Apical section of superior foreceps of male hypopygium short and broad, somewhat boot shaped (figs. 2 and 3); Formosan species.
formosanus Malloch.
3. Anterior margin of thorax, including the humeri and propleura, fulvous; hypopygium of male as Figures 4 and 5----- *sumatranus*, new species.
Thorax entirely metallic blue, not fulvous anteriorly except sometimes on the propleura----- 4.
4. Face and frons entirely deep metallic blue----- *nigrocoeruleus*, new species.
Head fulvous, with blue tinge on face and frons----- *laevis* van der Wulp?

SPANIOCELYPHUS SCUTATUS Wiedemann

Spaniocelyphus scutatus WIEDEMANN Aussereur. Zweifel. Ins., vol. 2, p. 601, 1830.

I have before me many specimens of this species from the Philippines, and present figures of the male hypopygium of one of these specimens. (Figs. 1, 2.)

Localities, Manila; Mount Maquiling, Luzon; Davao, Mindanao; and Tanglecolan, Bukidnon (C. F. Baker); Rangoon, Burma, March, 1927 (F. J. Meggitt.)

SPANIOCELYPHUS FORMOSANUS Malloch

Spaniocelyphus formosanus MALLOCH, Ent. Mitt. vol. 16, p. 161, 1927.

This Formosan species was described in my paper already referred to herein. I present now figures of the hypopygium of the male. (Figs. 3, 4.)

SPANIOCELYPHUS SUMATRANUS, new species

Male.—Head shining fulvous yellow, with a slight purplish tinge on face and frons, no dark marks on face or cheeks; third antennal segment darkened above; palpi slightly darkened at apices. Thorax metallic blue, dorsum deep blue, humeral angles and extreme anterior margin fulvous; scutellum metallic blue, deep purple from base to beyond middle on disk, the apex blue. Abdomen black, with an aeneous or purplish tinge. Legs dull fulvous or tawny yellow, the mid and hind femora infuscated. Wings yellowish hyaline, quite noticeably yellow at apices.

Vertical margin quite sharp, ocelli in carina; the type has no vertical bristles remaining, but in the paratype there is a weak inner vertical on each side; face concave below middle in profile; labrum quite broadly exposed; antennae distinctly shorter than width of frons, basal segment hardly longer than second, third about as long as basal two combined; flat part of arista fully as long as third segment and about as long as the apical hairlike portion. Scutellum smooth except for a few widely separated shallow piliferous punctures. Inner cross vein of wing close to middle of discal cell; marginal cell as wide as submarginal at apex, the second vein almost rectangularly bent forward at apex. Hypopygium as Figures 7 and 8.

Length, 4 mm.

Type, Wai Lima, Sumatra, 1921 (Karny and Siebers); *paratype*, Kepahiang, Sumatra, 1,960 feet, November-December, 1925 (H. C. Kellers.)

Type.—In author's collection.

Paratype.—Cat. No. 41085, U.S.N.M.

SPANIOCELYPHUS LAEVIS (van der Wulp)

Celyphus laevis VAN DER WULP, *Tijdschr. v. Ent.*, vol. 22, p. 53, 1881.

Specimens which appear to belong to this species are very similar to *scutatus*, differing essentially only in having the mesonotum and scutellum less punctate, the latter being evidently punctate only at base laterally.

Localities, one specimen, Los Banos, 13 specimens, Mount Maquil-ing, Luzon (C. F. Baker).

SPANIOCELYPHUS NIGROCOERULEUS, new species

Female.—Head glossy black, with a blue tinge, frons at anterior lateral angles, cheeks, and lower part of occiput, brownish yellow, upper occiput dark brown; antennae, aristae, and palpi, fuscous. Thorax and scutellum glossy black, with a blue tinge, abdomen concolorous. Legs brownish yellow, coxae and mid and hind femora

fuscous, tibiae triannulate with fuscous, most evident on hind pair. Wings grayish hyaline. Knobs of halteres fuscous.

Frons about twice as wide as long, raised behind and in front centrally, all vertical bristles present but small; facial depression a little below middle; arista with the basal portion about twice as long as apical. Thorax and scutellum absolutely smooth, each with some scattered microscopic hairs. Fifth abdominal sternite about twice as wide as long. Wings normal.

Length, 4.5 mm.

Type.—Cat. No. 41086, U.S.N.M. Cuernos Mountains, Negros (C. F. Baker).

This is the darkest colored species now known to me. If *nigrifacies* de Meijere belongs to this genus it may be distinguished from it by the much smaller size, 2.5 mm. in length, and the dark steel-blue color of the frons.

Subfamily SAPROMYZINAE

Dr. F. Hendel has recently published a key to the genera of the entire family exclusive of the Celyphinae,⁴ and Dr. R. Frey has in addition to this published a generic key to the species known to him⁵ so that it appears almost unnecessary to give a generic key in this paper. There are however some differences of opinion as to the validity of certain of the genera and some elucidation is required to make matters clear to anyone intending to make a more intensive study of the Philippine or Oriental fauna.

Doctor Frey erected 6 new genera in his paper and so far as possible I have dealt with these in the text following. Certain of Doctor Hendel's genera I can not accept, and one or two others are given a different interpretation so that some notes at least are required to explain these points.

Genus STEGANOPSIS de Meijere

This genus in the strict sense is confined to the Eastern Hemisphere. There is a closely related form in the Americas and to make clear the distinctions between the two segregates I include the latter in the key given below. I incline to the opinion that *Steganolauxania* is entitled to no more than subgeneric distinction. All species of the genus known to me are included in the key.

KEY TO THE SPECIES

1. Anterior pair of orbital bristles directed backward; frons uniformly shining; face smooth and glossy, convex above middle (America).

Subgenus *Steganolauxania* Frey, *latipennis* Coquillett.

- Anterior pair of orbital bristles directed inward; frons not uniformly shining ----- 2.

⁴ Encycl. Entomol., Diptera, vol. 2, fasc. 3, 1925.

⁵ Acta Soc. Faun. Flor. Fennica, vol. 56, No. 8, 1927.

2. Longest hairs on arista not as long as width of third antennal segment; thorax with two series of intradorsocentral hairs; palpi black at apices; wings browned, more noticeably so along costa, their apices usually narrowly whitish from tip of second to tip of fourth vein; frons dull yellow, with a large velvety black ocellar mark, and brownish marks at bases of the orbital bristles; face usually with a large violet-black spot on each side; halteres yellow----- 3.
Longest hairs on arista more than twice as long as width of third antennal segment----- 5.
3. Wing tip not whitish hyaline; face unspotted; second wing vein not very close to costa----- *divergens* Frey.
Wing tip whitish hyaline; face spotted; second wing vein close to costa-- 4.
4. Abdomen largely glossy blackish; fore tibia at middle, and hind femora basally, more or less darkened; hypopygium as Figure 11.

melanogaster (Thomson).

Abdomen normally glossy testaceous yellow; fore tibia and hind femora not darkened; hypopygium as figure 12----- *convergens* Hendel.
5. Wings entirely yellowish hyaline; head yellow, marked as in the two next preceding species, but the palpi entirely yellow; legs yellow, a small dark preapical ventral mark on fore femur, and the apical four segments of fore tarsi dark; face smooth and glossy, evenly convex; intradorsocentral hairs biseriate----- *minor* (de Meijere).
Wings conspicuously infuscated; thorax and abdomen black, pleura with, or without, a large yellow mark above; legs more extensively black; palpi and halteres fuscous; intradorsocentral hairs quadriseriate----- 6.
6. Head largely yellow, face entirely so; second wing vein not closer to costa than to third vein----- *divergens* Frey.
Head largely or entirely black, face not entirely yellow; second wing vein nearer to costa than to third vein----- 7.
7. Thoracic dorsum and pleura black, the former with series of spots and vittae, and the pleura with spots and streaks, of black color on a gray-dusted ground; face not rugose; wings fuscous, with irregular hyaline markings on disk, a rather large round hyaline spot beyond middle of first posterior cell, and a small one below it, and the narrow apices most conspicuous; inner cross vein about one-third from apex of discal cell (Australia)----- *annulipes* Malloch.
Thoracic dorsum black, with or without gray dusted vittae, but without black dots; wings not marked as above, the inner cross vein close to middle of discal cell----- 8.
8. Fore legs entirely black----- 9.
Fore legs not entirely black----- 10.
9. Mesopleura yellow; apices of wings not hyaline----- *bakeri* Bezzi.
Mesopleura black; apices of wings hyaline----- *aterrima* Frey.
10. Frons opaque yellow, the ocellar spot and a spot on each side at upper eye margin opaque black; tip of wing not hyaline; mid and hind tibiae yellow.

pusilla Frey.

Frons black; other characters not as above----- 11.
11. Center of frons entirely glossy black, ocellar spot and a large mark at anterior margin on each side velvety black; apex of wing hyaline; mid and hind tibiae pale, with black annuli; pleura and fore metatarsus black.

buruensis Malloch.

Center of frons not entirely glossy; pleura on upper half, and the fore metatarsus yellow----- 12.

12. Thoracic dorsum unicolorous black, sometimes faintly gray vittate anteriorly----- pupicola de Meijere.
 Thoracic dorsum with 10 or 12 complete narrow pale gray-dusted vittae.
 multilineata de Meijere.

STEGANOPSIS CONVERGENS Hendel

Steganopsis convergens HENDEL, Suppl. Ent., vol. 2, p. 102, 1913.

I suspected that this species might be the same as *melanogaster* (Thomson), but the male hypopygia are entirely distinct as shown in Figures 11 and 12. The only other distinctions are those listed in the foregoing key.

I have not seen *melanogaster* from outside of Australia, but *convergens* occurs in Formosa and the Philippines. I have a male from Cuernos Mountains, Negros (C. F. Baker).

It appears evident to me that *Pachycerina apicalis* Bezzi is this species. Frey considers that the first name for the species is *curvinervis* (Thomson).

STEGANOPSIS MINOR (de Meijere)

Steganopsis minor DE MEIJERE, Tijdschr. v. Ent., vol. 57, p. 237, 1914 (*Pachycerina*).

I have examined a specimen of this species sent to me by Doctor de Meijere and find that it belongs to this genus and not to *Pachycerina* in which it was described, and in which Frey retained it. It is known to me from Java, but Frey records it from Banahao, Luzon.

STEGANOPSIS BAKERI Bezzi

Steganopsis bakeri BEZZI, Philippine Journ. Sci., vol. 8, p. 315, 1913.

This species is unknown to me. Recorded only from Los Banos, P. I.

STEGANOPSIS DIVERGENS Frey

Steganopsis divergens FREY, Acta Soc. pro Fauna et Flora Fennica, vol. 56, No. 8, p. 10, 1927.

As I have not seen this species and am uncertain of some of the characters of it I have inserted it in two places in the key.

Described from Mount Banahao, Luzon.

STEGANOPSIS PUSILLA Frey

Steganopsis pusilla FREY, Acta Soc. pro Fauna et Flora Fennica, vol. 56, No. 8, p. 13, 1927.

Described from Limay, Luzon.

STEGANOPSIS MULTILINEATA de Meijere

Steganopsis multilineata DE MEIJERE, Tijdschr. v. Ent., vol. 67, 1924, p. 53.

I have examined the type specimen of this species sent to me by Doctor de Meijere and consider *undecimlineata* Frey is synonymous with it.

Frey described his species from Banahao, Luzon, and Kolambugan, Leite.

This species and *pupicola* occur also in Ceylon (W. Horn).

Genus LYPEROMYIA Frey

This genus is unknown to me. It is closely allied to *Steganopsis*, being distinguished mainly by the presence of four equally strong pairs of dorsocentral bristles, one sternopleural, shorter second wing vein, and narrower frontal triangle.

Genotype.—*Lyperomyia calopus* Frey.

LYPEROMYIA CALOPUS Frey

Lyperomyia calopus FREY, Acta Soc. pro Fauna et Flora Fennica, vol. 56, No. 8, p. 15, 1927.

A black species, with gray-dusted spot on each orbit near antennae, yellow third antennal segment, and black fore legs, the latter with coxae, and a broad ring at middle of femora, yellow, apical third of tibia white, mid and hind legs yellow, coxae entirely, mid femora with exception of apices, hind femora entirely, and apices of tarsi, black. Wings yellow, bases brown, veins somewhat brownish clouded.

Described from Mount Polis, Luzon.

Genus XANGELINA Walker

This genus has a peculiarly shaped head (Figs. 13 and 14), the frons being very steep, the face broad and evenly, though slightly, convex and glossy, and the divisions below the eye exceptionally distinct. The anterior orbitals in *basiguttata* are almost indistinguishable microscopic hairs, and are incurved, while the ocellars are lacking. The thorax has four pairs of dorsocentral bristles and acrostichals, the anterior pair of each being in front of the suture; there are two distinct sternopleurals; and the wing is as in *Sapromyza* Fallen. There is no anteroventral comb on the fore femur, and all the tibiae have the preapical dorsal bristle distinct, the one on hind pair being long and fine.

XANGELINA BASIGUTTATA Walker

Xangelina basiguttata WALKER, Proc. Linn. Soc. London, vol. 1, p. 32, 1857.

A shining testaceous yellow species, with two black spots on apex of scutellum, and a black mark at apex of auxiliary vein of wing; inner cross vein of wing faintly clouded.

Length, 4.5 mm.

I have seen the species from Java, submitted by Doctor de Meijere.

Hendel does not include this genus in his key, in which it runs to *Sciasmomyia* Hendel, though evidently distinct from it, the latter having two pairs of equally long backwardly bent orbitals and a pair of strong ocellars, in addition to other differentiating characters. The African species *Lauzania submetallica* Loew belongs to *Xangelina*.

PLEURIGONA, new genus

Generic characters.—This genus will run down in Hendel's key to genera to *Ichthyomyia* de Meijere, but it is readily distinguished therefrom by the small conical projection of the propleura directly over the fore coxa, the lack of a propleural bristle, the much less prominent face, biemarginate vertical margin, lack of ocellar bristles, and the pronounced downward curvature of the apical section of the fourth wing vein. This last character distinguishes it also from any other genus of the family known to me at this time.

Genotype.—The following species.

PLEURIGONA CURVINERVIS, new species

Male.—Shining testaceous yellow, the type specimen greasy but with evidences of two dark submedian lines on anterior half of mesonotum. Wings quite noticeably yellow, veins brown, apices of first, second, and third, darker, but without a surrounding cloud.

Frons about 1.5 as wide as long in center, the vertex sharp and with a shallow emargination on each side of the ocellar triangle, posterior ocelli on edge of vertex, the four vertical and two post-vertical bristles quite well developed, ocellars lacking, both pairs of orbitals very weak and short, upper pair at almost their own length from eyes, the shorter anterior pair even farther from eyes; orbits not differentiated; surface of frons bare; face broad and evenly convex, shining, about 1.75 as high as frons; cheek about two-thirds as high as eye, the hairs fine and rather long; basal antennal segment very short, third about twice as long as wide; arista with sparse hairs, the longest about as long as width of third antennal segment; palpi slender. Thorax seen from the side pronouncedly arched, with 1 or 2+3 or 4 pairs of dorsocentrals and 2+4 pairs of acrostichals; the presutural, notopleural, and humeral bristles, quite fine, no sternopleural visible in type; scutellum pronouncedly convex, with four fine bristles. Abdomen short, the hypopygium small. Fore femur without an anteroventral comb; fore and hind tibiae with the preapical dorsal bristle quite long and fine, the mid tibia with that bristle short and strong. Inner cross vein at middle of discal cell; outer cross vein close to middle of wing; marginal cell rather wide and uniform, the second vein roundly curved forward at apex; third

vein straight; fourth very conspicuously curved down from near middle of its apical section, the first posterior cell fully twice as wide at apex as at outer cross vein; costa as in *Sapromyza*.

Length, 5 mm.

Type.—Cat. No. 41075, U.S.N.M. Mount Maquiling, Luzon (C. F. Baker).

The head in this genus is very similar to that of *Xangelina* Walker, but in the latter the frons is not so sharp, nor is it biemarginate, and the upper orbital is long and strong, while the stigmal region is also normal, with a strong bristle, and the fourth vein is but slightly divergent from third apically.

Genus AMPHICYPHUS de Meijere

This monobasic genus is readily distinguished from any other in the subfamily by the presence of an unequal pair of strong curved black spurs at apex of hind tibia on its anteroventral side, the longest of which is fully half as long as the basal segment of hind tarsus. The hairs on the entire insect including those on the legs are very long and almost bristle-like, the third antennal segment tapers to the apex, the arista is short haired, the anterior orbital bristles are incurved, the scutellum is slightly tumid at bases of the apical bristles, and the costa has only fine hairs, no short black setulae being evident.

AMPHICYPHUS RETICULATUS (Doleschal)

Ensina reticulatus DOLESCHAL, Natur. Tijdschr. v. Nederl. Indie., p. 412, 1856.

Locality, Mount Maquiling, Luzon (C. F. Baker).

This species has been recorded from the Dutch East Indies and Australia, but this is the first record of its occurrence in the Philippines.

EUPROSOPOMYIA, new genus

Generic characters.—Head in profile as in Figure 15, the face shining, and with a subconical production, below the level of which there is a transverse impression. The frons is similar to that of *Prosopomyia* Loew, having both the pairs of orbitals bent backward, and the surface with rather dense short hairs. In the type the ocellars are bent backward, but this may be due to injury. From *Prosopomyia*, to which genus it runs in Hendel's recent key, the genus may be distinguished by the presence of several strong bristles close to the lower hind margin of each eye. These bristles are not on a callosity, which is the case in *Australina* Malloch, and the latter genus has the frons more than twice as long as wide and

sparsely haired. The apices of the wings in the type specimen are damaged, but I believe the costa is the same as in *Homoneura*.

Genotype.—The following species.

EUPROSOPOMYIA MACULOSA, new species

Male.—Head testaceous, frons opaque, with ocellar spot brown, and two brown submedian stripes which curve round the anterior extremities of the orbits and extend between those and the eyes; face glossy, with 9 black spots. One between and above the antennae, one between each antenna and eye, and a larger one between and below antennae, all velvety, a large glossy one on lower central part of convexity, and two on each side of it, the lower one not so glossy as the upper; a brown streak along the transverse impression; antennae and palpi testaceous yellow. Ground color of thorax testaceous, largely obscured by fuscous markings, the dorsum with six subcontiguous vittae and the lateral margins fuscous, humeri with a central dark mark; pleurae largely fuscous; scutellum dark on each side and in center. Wings fuscous, with a pale mark on each side of inner cross vein, and the hind margin narrowly hyaline, the hyaline part bidentate in second posterior cell, and very narrow round apex of wing. Halteres yellow.

Frons about 1.5 as long as wide, slightly widened anteriorly; arista sparsely short haired. Thorax with three pairs of postsutural dorso-centrals and about six series of intradorsocentral hairs, the median two series strong posteriorly; scutellum subconvex; both sternopleurals strong. Abdomen stout; hypopygium as Figure 16. Legs stout; fore femur with an anteroventral comb and short, rather irregular posteroventral bristles; mid tibia with one long and one short apical ventral bristle; hind femur with some preapical anteroventral setulae; fore and hind tibiae with short preapical dorsal bristle. Inner cross vein a little beyond middle of discal cell; penultimate section of fourth vein about four-fifths as long as ultimate section.

Length, 4 mm.

Type.—Cat. No. 41601, U.S.N.M. Cuernos Mountains, Negros (C. F. Baker).

Genus PROSOPOPHORELLA de Meijere

This genus is readily distinguished by the shape of the head, which when seen from in front is as Figure 17, the process on middle of lower margin of face, and the angular production of the cheeks being unique in this family. Another outstanding character is the presence of short hairs on the disk of the scutellum. Both pairs of orbitals are bent backward, and, though the face is noticeably convex, it is not at all shining but entirely dull. The ocellars are long, postver-

ticals short, and the arista short haired. Thorax with three pairs of postsutural dorsocentral bristles and one sternopleural. Legs rather long, fore and mid femora very much attenuated apically, the former with an anteroventral comb, fore and mid tibiae and tarsi slender, the preapical dorsal bristle distinct only on the hind tibiae.

The genus is monobasic.

PROSOPOPHORELLA BUCCATA (de Meijere)

Prosopophora buccata DE MEIJERE, Tijdschr. v. Ent., vol. 53, p. 144, 1910.

Male.—Head testaceous. Thorax black, shining, pleura brownish and with some patches of whitish dust. Abdomen shining black. Legs testaceous. Wings fuscous, with the following hyaline marks: An almost complete fascia proximad of the inner cross vein, a short fascia from costa to fourth vein proximad of outer cross vein, a quadrate mark at middle of first posterior cell, and another just proximad of it in second posterior cell, a mark over outer cross vein, and one at wing tip.

Length, 4.5 mm.

Habitat, Nederland Indies.

Genus PACHY CERINA Macquart

The characters cited by Hendel in his recently published key to the genera for the separation of this genus from *Physogenia* Macquart consist of the position of the anterior pair of orbitals, more closely placed than posterior pair in *Physogenia* and equally widely separated in *Pachycerina*, the differently haired aristae, shortly and densely haired in *Pachycerina* and longer and more sparsely haired in *Physogenia*, with slight differences in the form of face and occiput. Only the first mentioned character appears to be of any use for distinguishing the genera as represented in the species before me. The only species of *Physogenia* which I have available now is *ferruginea* Schiner, and in the male of it the mid tarsus has the basal segment thickened, which is not the case in any of the species of *Pachycerina* available to me now. In my paper on Sumatran Sapromyzidae, which has already been referred to, I separated *leucochaeta* de Meijere from the other species previously included in this genus, erecting the genus *Melanopachycerina* for it and two other species. Doctor Frey retained this species in *Pachycerina*, but he also retained *Steganopsis minor* (de Meijere) in the genus so that he did not apparently have a very clear concept of the generic characters.

I can not determine to what genus *Pachycerina cyaneostoma* Frey belongs, but am doubtful if it belongs here. The following key will serve to distinguish the species of the genus now known to me from the Orient.

KEY TO THE SPECIES

1. Hairs on arista rather dense and not erect, the longest not as long as basal width of third antennal segment----- 2.
Hairs on arista not dense, erect, and the longest very distinctly longer than basal width of third antennal segment----- 5.
2. Face without dark discal spots; a deep black velvety spot between each antenna and eye; third antennal segment shorter than usual, not over twice as long as its basal width; seventh abdominal tergite with a pair of black spots----- *sigillata* (de Meijere).
Face with a pair of dark discal spots above middle; no black spot between each antenna and eye; third antennal segment elongate, about four times as long as its basal width----- 3.
3. Thorax with two series of intradorsocentral hairs, and four or five fine brownish lines on dorsum; fore femur entirely yellow; abdomen with a pair of small round black spots on seventh tergite----- *javana* Macquart.
Thorax with four series of intradorsocentral hairs, and ten fine black lines on dorsum; fore femur with a black apical mark; abdomen without a pair of black spots on seventh tergite----- 4.
4. Abdomen broadly deep black on dorsum, narrowly yellow on sides.
----- *decemlineata* de Meijere.
Abdomen entirely yellow----- *flaviventris*, new species.
5. Facial spots very small and pale brown in color; wings quite intensely yellow along costa----- *sexlineata* de Meijere
Facial spots larger and deep black; wings not more noticeably yellow along costa than elsewhere----- *parvipunctata* de Meijere.

PACHYCERINA JAVANA Macquart

Pachycerina javana MACQUART Dipt. Exot., Suppl. 4, p. 274, 1850 (*Sapromyza*).

The largest species known to occur in the Orient, readily distinguished from its allies by the characters listed in the key. The male has a pair of very long basal hypogygial forceps which taper apically, and extend forward below abdomen to well in front of its middle.

I have before me a series of specimens from Baguio, Benquet Province (C. F. Baker).

PACHYCERINA FLAVIVENTRIS, new species

This species is very similar to *decemlineata*, being the same in color except in having abdomen entirely yellow. The details in the above key are sufficient to insure its recognition.

The outer partial black vitta behind suture of thorax, as well as the two black pleural vittae, so distinct in *decemlineata*, are not visible in the type of *flaviventris*, and the pair of black spots on face are smaller than in that species.

Type.—Cat. No. 41697, U.S.N.M.; Mount Maquiling, Luzon Province (C. F. Baker).

The other species listed in key I have seen only from Java; the species *sigillata* was described as a *Lauzanina*, but an examination of

the type sent to me by Doctor de Meijere discloses that it belongs here. I do not know *latifrons* Thomson which Frey lists in this genus. He suggests its being the same as *ocellaris* Kertész, but does not record it from the Philippines. As already indicated I have not seen *cyaneostoma* Frey, which is a black species with a large yellow pleural mark and pale bases to the tarsi, and suspect that it does not belong here. It is from the Philippines.

Genus MELANOPACHY CERINA Malloch

This genus is distinguished from *Pachycerina* by the possession of 4 pairs of dorsocentral bristles (1+3), and a preapical anteroventral comb on the fore tibia. There are three species assigned to the genus as below.

KEY TO THE SPECIES

1. Ocellar bristles quite large, divergent and forwardly directed; frontal orbits glossy black, sharply differentiated from the velvety black interfrontalia, narrowest just in front of ocelli, and gradually widened to anterior margin at which point each is wider than the space between them; fore femur with at least two bristles on apical half of posteroventral surface.

leucochaeta (de Meijere).

Ocellar bristles indistinguishable; interfrontalia not narrower at anterior margin than in front of ocelli; fore femur with one posteroventral bristle. 2.

2. Face bicolored, black and fulvous, with a conspicuous transverse depression on lower half; posthumeral bristle about as long as the dorsocentrals; fore legs entirely black except the coxae and knees.---- albiseta (Hendel).
Face entirely glossy black, evenly and prominently convex; posthumeral bristle very short and weak; fore legs with apical halves of tibiae, and the coxae, white, the femora yellow at bases, darkened at apices, basal halves of tibiae and all of tarsi black.----- varipes Malloch.

MELANOPACHY CERINA LEUCOCHAETA (de Meijere)

Pachycerina leucochaeta DE MEIJERE, Tijdschr. v. Ent., vol. 57, p. 256, 1914.

This species occurs in the Nederland Indies and Formosa, and Doctor Frey records it from the Philippines.

It is a conspicuous black species about 5 mm. in length, with hyaline wings.

The other species occur in the Nederland Indies and should be found in the Philippines. I consider *Camptoprosopella angustilimbata* de Meijere is *albiseta*.

Genus LAUXANIELLA Malloch

One species from Formosa has been assigned here, *tenuicornis* Malloch. It is very similar in general appearance to *M. leucochaeta*.

Genus **CALLICLYPEUS** Frey

This genus was distinguished from *Pachycerina* by Frey principally by the shorter third antennal segment, which is not much over twice as long as wide, and were it not for the fact that the description further indicates that the anterior pair of dorsocentral bristles is proximad of the suture I would not hesitate to consider it merely a synonym of that genus as *Pachycerina sigillata* has a similar short third antennal segment. However, without having access to the genotype, I can not determine the status of the concept and accept it provisionally as distinct.

CALLICLYPEUS BOETTCHERI Frey

Calliclypeus boettcheri FREY, Acta Soc. pro Fauna et Flora Fennica, vol. 56, No. 8, p. 19, 1927.

This species appears to be very similar to *Pachycerina sigillata* de Meijere in color, the principal distinction lying in the absence of the pair of black marks on the face in *sigillata*, only the spots between the antennae and eyes being present. The black spots on the seventh abdominal tergite of *sigillata* are not present in *boettcheri*, though the abdomen is darkened apically.

Locality.—Mumungan, Mindanao.

Genus **PHOBETICOMYIA** Kertész

This genus was erected for the reception of *Lauzanina lunifera* de Meijere. Frey, in his recent paper on Philippine Sapromyzidae, has included also *Lauzanina ornatipennis* de Meijere, and *boettcheri* Frey. The latter is the type species of *Poecilomyza* a new subgenus of *Homoneura* erected in the present paper, and *ornatipennis* belongs to another subgenus of *Homoneura*.

I have besides *lunifera* another Philippine species of *Phobeticomyia* before me.

The genus is readily distinguished by the slight, but evident, central bulbosity of the glossy face, backwardly directed anterior orbitals, and wing venation. The latter is similar to that of *Homoneura*.

KEY TO THE SPECIES

Wing with a hyaline fascia at extreme apex, and about four hyaline spots in second posterior cell in addition to the one on outer cross vein (fig. 18).

lunifera (de Meijere).

With a hyaline fascia at about its own width from apex, and no hyaline spots in second posterior cell except the one on outer cross vein (fig. 19).

preapicalis, new species.

PHOBETICOMYIA LUNIFERA (de Meijere)

Phobeticomyia lunifera DE MEIJERE, Tijdschr. v. Ent., vol. 53, p. 134, 1916 (*Laurania*).

Frey records this species from Port Bauga, Mindanao.

PHOBETICOMYIA PREAPICALIS, new species

In addition to the wing markings being distinct this species differs from *lunifera* in having the face glossy black, with a faint central vertical yellow stripe. In *lunifera* the face is glossy black, with the entire lower margin, and a broad V-shaped mark on middle, yellow.

Length, 3.5 mm.

Type, male, and one *paratype*, both lacking the third antennal segment, Singapore (C. F. Baker). In author's collection.

Genus TRYPANEOIDES Tonnoir and Malloch

This genus is distinguished from all others except *Melinomyia* Kertész by the presence of two strong bristles on the mesopleura, one on upper hind margin, and the other, which is directed downward, close to middle of disk (the latter sometimes duplicated). From *Melinomyia* it may be distinguished by the presence of two sternopleurals, and the conspicuously marked wings. The costa is the same as in *Homoneura*, both orbitals are bent backward, the thorax has 1+3 strong pairs of dorsocentral and acrostichal bristles, the abdomen has sparse erect setulose hairs, and at apices of all tergites quite conspicuous bristles; there is always at least one conspicuous bristle a little beyond middle of anteroventral surface of hind femur; the intra-alar bristle is weak or absent; and the fore femur has no anteroventral comb.

The genotype, *guttata* Tonnoir and Malloch, is found in New Zealand. Below I present a key to the Oriental species known to me.

KEY TO THE SPECIES

1. Abdomen glossy black, entirely without markings; three clear spots on costa of wing between apices of first and second veins; arista rather long haired..... 2.
Abdomen brownish or fuscous, with conspicuous gray-dusted spots or markings, and sometimes with brown spots; at least four clear spots on costa between apices of first and second veins..... 6.
2. Wing with at least two complete clear fasciae in addition to some isolated clear spots..... 3.
Wing without uninterrupted clear fasciae, sometimes with transverse series of clear spots..... 5.
3. Wing with two clear fasciae, one just proximad of inner cross vein, and sometimes narrowly enclosing it, and the other at about its own width beyond outer cross vein, terminating on costa before apex of second vein, the clear mark on costa between the fasciae not extending over second vein..... *bicincta* (de Meijere).
Wing with three complete clear fasciae, the third one extending across the wing from apex of second vein, between the second one and the apical clear spot..... 4.

4. A clear fasciform mark on costa between the first and second fasciae extending over third vein and faintly to fourth----- *sumatrana* Malloch.
No clear mark on costa between first and second fasciae.----- *tricincta* Malloch.
5. Wing with but two clear spots in submarginal cell, one close to inner cross vein and the other on costa between apices on second and third veins.----- *pulchripennis* (de Meijere).
Wing with three clear spots in submarginal cell, the additional one being about one-third from apex of cell----- *fenestrata* (de Meijere).
6. Not more than 10 dark spots and blotches between fifth vein and margin of wing----- 7.
Not less than 20 dark spots and blotches between fifth vein and margin of wing----- 10.
7. Mesopleura with two discal bristles, one above the other----- 8.
Mesopleura with only one discal bristle----- 9.
8. The four clear spots on costa between apices of first and second veins subequal in size and quite large; eight clear spots in first posterior cell including the large one at apex; length 2.5 mm----- *tephritina* (de Meijere).
More than four clear spots in marginal cell, some very small and others much larger; about 12 clear spots in first submarginal cell including the large one at apex; length 4 mm----- *major*, new species.
9. Two clear spots between apices of second and third veins against costa, the additional one touching tip of third vein and very small; 14 or 15 clear spots in first posterior cell, including the large one at apex.----- *hyalipuncta* Malloch.
One clear spot between apices of second and third veins against costa; about eight clear spots in first posterior cell, including the large one at apex----- *octomaculata* Malloch.
10. Wing narrower than usual, apical hind margin slightly irregular in outline, outer cross vein distinctly less than half as long as ultimate section of fourth vein, the pale markings on wing pale brown except the anterior portions of the spots along costa, and the narrow hind margin, which are clear----- *morio* (de Meijere).
Wing much broader than usual, conspicuously irregular in outline along apical hind margin, outer cross vein bisinuate, much more than half as long as ultimate section of fourth vein, all the pale wing markings clear, reduced to mere dots or short streaks on most of disk.----- *trypetiformis* (de Meijere).

I have seen but one species of this genus from the Philippines, the above key being based upon material supplied by Doctor de Meijere and collected by Mr. E. Jacobson in Java and Sumatra, and by Doctor Toxopeus in Buru. Possibly species of the genus were sent to the late Dr. M. Bezzi by Prof. C. F. Baker, as I know he did send material in this family and also Trypetidae, with which latter family the species may be readily confused.

Doctor Hendel has stated in a recent paper that *fenestrata* de Meijere belongs to the genus *Trypetisoma* Malloch. The latter has no discal mesopleural bristle and the costa is the same as in *Sapromyza*. There is a close resemblance between the wings of *Homoneura picta* (de Meijere) and *Homoneura trypetoptera* (Hendel), and cer-

tain species of *Trypaneoides*, but I have seen both these species and they belong to *Homoneura*.

Sapromyza perpunctata Lamb, from the Seychelles Islands is apparently a species of this genus related to *octopunctata* Malloch.

TRYPANOIDES MAJOR, new species

Female.—Black, with dense yellowish gray dust and marked with dark brown. Face with a transverse brown line on upper part, and a biarcuate line of same color near lower margin which connects with a spot on each parafacial at vibrissal angle; antennae brownish yellow, darker below; palpi yellow, fuscous at apices; frons dark at bases of bristles. Thoracic dorsum and pleura with numerous irregular dark brown marks. Abdomen with rather large pale gray dusted spots on hind margins of tergites, a bristle in each spot except the central one which has a bristle on each side of it. Legs testaceous, femora largely brown basally, hind pair dark brown at extreme tips, hind tibia with a narrow dark brown band near base. Wings dark brown, with numerous hyaline spots, four rather large unequal spots and one or two much less distinct streaks in marginal cell, one spot against costa in apex of submarginal cell, preceded by 4 minute dots, then a large oblong spot the inner extremity of which is almost above outer cross vein, and a smaller spot near base of cell; first posterior cell with 12 or 13 clear spots, some very small; 4 or 5 spots in second posterior cell, and about 8 in discal cell, the latter mostly fused in pairs, none of the spots in either cell touching outer cross vein; the apical spot in anal field isolated, the others connected. Knobs of halteres dark brown.

Arista very short haired; orbitals strong. Thorax as in the other species, but the mesopleura with two discal bristles. Each tergite with one series of long erect bristles. Hind femur with about three anteroventral bristles on apical half.

Length, 4 mm.

Type.—Cat. No. 41132 U.S.N.M. Baguio, Benquet Province, P. I. (C. F. Baker).

The type bears the number 19391, which indicates that another specimen was sent to some specialist for identification.

Genus MINETTIA Robineau-Desvoidy

There are three segregates of this genus in the material before me. One of these (*Minettiella*, new subgenus) has but one well-developed sternopleural bristle, the arista pubescent or short haired, frons entirely shining, and the face flat. The other two segregates have two sternopleural bristles, the frons largely or entirely dull, the arista longer haired, and most of the species have the face with

two slight, but distinct, rounded elevations on lower part. The last two segregates I retain in *Minettia*, the one with the facial elevations being the typical form. In the following key I include all species known to me from the Orient, some of them being dependably separable only by the structure of the male hypopygia.

KEY TO THE SPECIES

1. Sternopleura with but one distinct bristle; arista pubescent or very short haired; frons entirely shining; face flat (*Minettiella*, new subgenus)..... 2.
- Sternopleura with two distinct bristles; arista distinctly haired, the shortest hairs at least as long as half the width of third antennal segment; frons largely dull; face usually with two slight elevations below..... 3.
2. Dorsocentral bristles 1+3, acrostichals 1+4; mesopleura with an isolated anterior bristle below middle..... *atratura* (de Meijere).
- Dorsocentral bristles 0+2 or 0+3, acrostichals the same; mesopleura without an isolated anterior bristle below middle..... *atrata* (de Meijere).
3. Face without distinguishable elevations below; male hypopygium with a stout, tubelike, downwardly projecting central process, and without heavily chitinized inner hooks (Fig. 20); arista short haired..... 4.
- Face with a quite noticeable elevation on each side below; male hypopygium without a tubelike central process, usually with two or four strong black chitinous hooks or spines, which are more or less curved, and generally asymmetrical; arista plumose..... 5.
4. Large species, fully 5 mm. in length; hind tarsus with the basal segment slightly compressed in both sexes; ocellar bristles about twice as long as anterior orbitals..... *tubifera* Malloch.
- Smaller species, about 4 mm. in length; hind tarsus with basal segment normal in structure in both sexes; ocellar bristles about as long as anterior orbitals..... *hoozanensis* Malloch.
5. Bases of wings quite distinctly blackened; knobs of halteres black; abdomen with distinct dusting on dorsum..... 6.
- Bases of wings not blackened; knobs of halteres black; abdomen entirely shining black, without distinct dusting; hypopygium as Figures 21 and 22. *nigrohalterata* Malloch.
- Bases of wings not darkened; knobs of halteres yellow; abdomen shining black, with grayish dusting evenly distributed..... 8.
6. Abdomen reddish testaceous, with evenly distributed grayish dusting. *rufiventris* (Macquart).
- Abdomen black, with grayish dusting, and a dark brown transverse band in middle of each tergite..... 7.
7. Hind tibia with a distinct preapical dorsal bristle; male hypopygium as Figure 23..... *fuscofasciata* (de Meijere).
- Hind tibia without a preapical dorsal bristle; male hypopygium as Figure 24. *quadrispinosa* Malloch.
8. Wings grayish hyaline; anterior one of the postsutural pairs of dorsocentrals as close to suture as posterior pair is to hind margin; hypopygium as Figure 25..... *obscura* (de Meijere).
- Wings, halteres, and squamae and their fringes, honey yellow; anterior pair of postsutural bristles much farther from suture than posterior pair is from hind margin..... 9.

9. Basal portion of male hypopygium (eighth tergite) with the apical lateral arms hinged and furcate, or with internal tooth (Fig. 26).

luteitarsis (de Meijere).

Basal portion of male hypopygium with the apical lateral arms connected with the basal part by a narrow neck, not hinged to it, and sharp at apex (Fig. 27)----- *philippinensis*, new species.

MINETTIELLA, new subgenus

This subgenus is erected for the reception of two species, both of which are glossy black, with immaculate wings, yellow halteres, and characters as given in key.

Subgenotype.—*Lauxania atratula* de Meijere.

Neither species is amongst those before me from the Philippines, though it is very probable that one or both may occur there.

Subgenus MINETTIA Robineau-Desvoidy

In his paper on Philippine Sapromyzidae Doctor Frey gives the subgeneric name *Euminettia* to the segregate of *Minettia* in which there are no elevations on the face, naming *lupulina* Fabricius as genotype. I rather doubt the possibility of distinguishing the segregates by this character, as the elevations, while quite noticeable in some species, are very inconspicuous in others and it is very difficult, if not impossible, to draw the line anywhere. The same author erects the subgenus *Calominettia* for the South American species *geminata* Fabricius. The latter he distinguished from *Euminettia* by the divergent apical scutellar bristles, a rather variable character.

There are but two species of those listed in the key amongst those before me from the Philippines, though undoubtedly more occur there.

MINETTIA RUFIVENTRIS (Macquart)

Minettia rufiventris MACQUART Dipt. Exot. Suppl. 3, p. 68, 1847.

This species appears to be very widely distributed in the Orient, occurring in Formosa, the Nederland Indies, etc. I have before me one specimen from Imugin, N. Viscaya (C. F. Baker), and Frey records it from Luzon.

MINETTIA PHILIPPINENSIS, new species

Male and female.—Similar to *luteitarsis* (de Meijere) in coloration. Black, the face and frons whitish dusted, the former most densely so; thorax with brownish dust and four faint vittae on dorsum; abdomen shining, without dusting; wings yellowish hyaline, almost honey yellow; halteres honey yellow. The legs are pitchy black, with the bases of tibiae slightly yellowish and the tarsi yellow.

Structurally similar to *luteitarsis*, the frontal bristles all strong, arista with long hairs; thorax with three pairs of dorsocentrals, the

anterior pair well behind the suture, and shorter than the second pair; lower anterior part of mesopleura with the hairs long and setulose. Hypopygium as Figure 27.

Length, 6 mm.

Type, male and *allotype*, Mount Maquiling, Luzon Province; para-type male, Butuan, Mindanao (C. F. Baker).

The species of this genus in the Orient present very good characters in the structure of the male hypopygia for their separation, but these characters have not been used to any extent in describing the species from this or any other region and it is difficult to distinguish some of them on color alone, as they are very similar in appearance. A comparison of the figures of the hypopygia in this paper indicates, if the structure of these organs indicates anything, that there are four groups in the lot: *tubifera*, *nigrohalterata*, and *philippinensis*, representing separate types, and *obscura*, *quadrispinosa*, *luteitarsis*, and *fuscofasciata* another. Only *tubifera* lacks the facial elevations. It is noteworthy that the American species with elevations on the face, and also the genotype of *Minettia*, have entirely different hypopygia from this oriental group, there being no heavily chitinized inner hooks present. It is, of course, impossible to find correlated genital characters in the females, so that no groups can be based upon the structure of the male hypopygia, no matter how distinctive this may be.

Genus SAPROMYZA Fallén

I have before me at this time 16 oriental species of this genus which is not so abundantly represented here as in some other regions. Of these species one belongs to a segregate which I consider is entitled to subgeneric distinction, and it is treated thus herein. To facilitate identification of the species I present a diagnostic key.

KEY TO THE SPECIES

1. Fore femur with an anteroventral comb of minute black bristles apically; thorax black, with two broad submedian white-dusted vittae, and three pairs of strong dorsocentral bristles, the anterior pair close to suture; abdomen black, with a yellowish dorsocentral line on apical three or four tergites, and apices of all tergites white dusted; wings grayish hyaline, base and outer cross vein slightly fuscous clouded.

albocincta (de Meijere).

Fore femur with an anteroventral comb of minute black bristles apically; thorax yellow, with four pairs of dorsocentral bristles (1+3); abdomen yellow, with a large blackish mark on each side of each tergite except the basal one, which gives the dorsum the appearance of having a broad blackish vitta on each side; wings yellowish hyaline, outer cross vein and apices of veins 2, 3, and 4, conspicuously clouded with fuscous.

omei, new species.

Fore femur without an anteroventral comb of minute bristles; thorax and abdomen not colored as above; outer cross vein not clouded.----- 2.

2. Thorax with three pairs of dorsocentral bristles..... 3.
 Thorax with two pairs of dorsocentral bristles..... 6.
3. Wings broadly brown on costa from base to apex of third vein; species shining yellow in color, abdomen with a large deep black spot on each side of each tergite; thorax with four fuscous vittae, the submedian pair extending over the sides of scutellum, the others on notopleural sutures, and a fuscous streak over upper margin of sternopleura; legs yellow, with the apices of all femora, all of fore tibiae and tarsi, and extreme bases of mid and hind tibiae, fuscous..... *conspicua* Malloch.
 Wings entirely hyaline; species not marked as above..... 4.
4. A deep black mark between base of each antenna and eye; ocellar bristles small; prescutellar acrostichals strong..... *deceptor* Malloch.
 No black mark between each antenna and eye..... 5.
5. Anterior orbital bristles not much shorter than posterior pair and but little closer to them than the latter are to vertical bristles, the inner vertical pair not nearly twice as long as outer pair, ocellars minute; a small fuscous spot over ocelli; thorax without a conspicuous dark dorsocentral vitta, the prescutellar acrostichals lacking; abdomen with four black spots on fifth and other four on sixth tergite; wings glassy.
hyalipennis (de Meijere).
 Anterior orbitals minute and much closer to posterior pair than latter are to the verticals, inner verticals about twice as long as outer pair, ocellars long; a large obcordate velvety black mark extending from ocelli backward over the occiput, the vertex rounded; thorax with a complete, broad, black, dorsocentral vitta filling area between the dorsocentral series; abdomen largely brown; wings dull hyaline.. *koshunensis* Malloch.
6. Antennae deep black, apex of third segment fulvous yellow, sharply contrasting with the basal two-thirds; hairs on arista about as long as width of third antennal segment..... *inversa*, new species.
 Antennae either yellow or fuscous, the third segment never distinctly paler at apex than at base, usually the reverse, if largely pale at apex the arista is much shorter haired..... 6a.
- 6a. Longest hairs on arista never half as long as width of third antennal segment..... 7.
 Longest hairs on arista at least as long as width of third antennal segment..... 10.
7. Pleura entirely yellow, dorsum of thorax fuscous, with grayish dusting; hairs on arista black, much denser than usual, the longest about half as long as the width of third antennal segment; thorax with a pair of distinct prescutellar acrostichals; antennae with basal segments, and the extreme base of third segment, black, rest of latter yellow.
flavopleura Malloch.
- Pleura black or fuscous, concolorous with dorsum of thorax, usually the hairs on arista not dense and not half as long as width of third antennal segment..... 8.
8. Thorax with a pair of well developed prescutellar acrostichal bristles; head black, frons in front, and base of third antennal segment broadly, bright orange-yellow; thorax black, with slight brownish dusting on dorsum..... *fasciatifrons* Kertész.
 Thorax without a trace of prescutellar acrostichal bristles; head and antennae entirely dull yellow; thorax black, with a broad central stripe of yellow dust which extends over disk of scutellum..... 9.
9. Tibiae entirely pale..... *pollinifrons* Malloch.
 Tibiae darkened at bases and apices..... *annulifera* Malloch.

10. Thorax without distinct precutellar acrostichal bristles; basal two antennal segments deep black, third segment yellow----- 11.
 Thorax with a pair of distinct precutellar acrostichal bristles; basal two segments of antennae not or but little darker than apical part of third- 12.
11. Thorax testaceous, dorsum densely whitish gray dusted, with two faint dark submedian vittae; apex of scutellum broadly testaceous.
pusillima (de Meijere).
 Thorax yellowish gray, gray dusted, with a broad blackish gray vitta between the dorsocentral series which extends on to the scutellum.
pleuralis (Kertész)
12. Frons fulvous yellow, with a broad dark brown central vitta; antennae deep black, the base of third segment broadly fulvous yellow; thorax fulvous yellow, with six broad dark brown vittae on dorsum, the outer one on each side on the notopleural suture, and the pleura with two similar vittae----- *maquilingensis*, new species.
 Frons and thorax not colored as above----- 13.
13. Mesopleura with a conspicuous downwardly directed bristle near middle of disk; wing with a black spot at apex of auxiliary vein, and the base black; thorax black; abdomen testaceous, with six series of dark spots, which are most distinct on fifth tergite (*Xenosapromyza*, new subgenus).
cinctipes (de Meijere).
 Mesopleura with only fine hairs on disk----- 14.
14. Wing with a dark spot at apex of auxiliary vein; basal two antennal segments and base of third yellowish testaceous, sharply contrasting with apex of latter which is dark; thorax testaceous, dorsum with a central vitta and some sublateral marks brown; scutellum testaceous, with two brown discal marks; abdomen with six series of black spots; femora fuscous, with preapical yellow annulus----- *poecilogaster* (de Meijere).
 Wings without a dark spot at apex of auxiliary vein; only the base of third antennal segment yellowish, remainder of antennae fuscous; thorax fuscous, dorsum densely and uniformly pale gray dusted; scutellum gray at base, broadly black apically; abdomen with two or four series of black spots----- *quadrangulata* (de Meijere).

I have examined all of the Javanese species described by Doctor de Meijere, but only one of them has been received from the Philippines. The only other Philippine species known to me are the two described below.

XENOSAPROMYZA, new subgenus

This subgenus is distinguished from *Sapromyza* by the presence of one or two strong bristles near middle of mesopleura much like those in the genus *Trypaneoides*, but other respects it agrees closely with *Sapromyza*.

Subgenotype.—*Lauxania cinctipes* de Meijere.

SAPROMYZA (XENOSAPROMYZA) CINCTIPES (de Meijere)

Lauxania cinctipes DE MEIJERE, Tijdschr. v. Ent., vol. 53, p. 125, 1910.

I have seen only the type specimen of this species, from Java. Doctor Frey records the species as a *Homoneura* from Los Banos, but I think erroneously.

SAPROMYZA (SAPROMYZA) QUADRANGULATA (de Meijere)

Lauzania quadrangulata DE MEIJERE, Tijdschr. v. Ent., vol. 67, p. 48, 1924.

I have before me a specimen which evidently belongs to this species. It agrees with the type specimen, but is smaller, and has the legs less conspicuously banded, and the abdomen with smaller spots, and with four or even six series instead of but two as in the type. This last character may be variable, as there are traces in the type of additional series of spots besides the two submedian series, and the Philippine example is not fully matured, so accurate comparison is difficult.

Locality, Mount Maquiling, Luzon (C. F. Baker).

SAPROMYZA (SAPROMYZA) MAQUILINGENSIS, new species

Female.—Shining fulvous yellow. Frons with a broad, central, dark brown, or fuscous, vitta which covers the ocellar region and extends almost to anterior margin; face with a brownish transverse central mark which does not extend over parafacials; basal two antennal segments and apical third of third segment deep black; palpi black. Thoracic dorsum with six, pleura with two, dark brown or fuscous vittae; base of scutellum black in center. Abdomen darkened above centrally. Legs yellow, apices of fore femora on anterior side, and all of fore tibia and tarsus, fuscous. Wings yellowish hyaline. Halteres yellow.

Anterior pair of orbital bristles shorter than posterior pair, not as long as the slender ocellars; arista short plumose. Thorax with two pairs of postsutural dorsocentrals, one pair of prescutellar acrostichals, and six series of intradorsocentral hairs, the latter confined to anterior portion; no strong bristles on anterior part of mesopleura; both sternopleurals present. Fore femur without an anteroventral comb; mid tibia with one long apical ventral bristle. Inner cross vein close to middle of discal cell; ultimate section of fourth vein fully 2.5 as long as penultimate section.

Length, 3 mm.

Type.—Cat. No. 41161, U.S.N.M. Mount Maquiling, Luzon (C. F. Baker).

SAPROMYZA (SAPROMYZA) INVERSA, new species

Female.—Shining testaceous yellow. Frons broadly black across middle, and on the ocellar spot; antennae deep black, apical third of third segment bright fulvous yellow; aristae black at bases, paler beyond; palpi black, yellow at bases. Thoracic dorsum broadly infuscated, the lateral and posterior margins yellow; scutellum with a large central basal infuscation; notopleural margin fuscous; pleura with a fuscous vitta on upper margin of sternopleura; center of metanotum fuscous. Abdomen largely darkened at bases or tergites.

Extreme apices of femora and bases of the tibiae black. Wings hyaline. Halteres yellow.

Frons about as long as wide at vertex, narrowed anteriorly, all bristles present, outer verticals shorter than inner, anterior orbitals about half as long as posterior pair; antennae rather large, third segment rounded at apex and about twice as long as wide; longest hairs on arista about as long as width of third antennal segment; palpi slender. Thorax with two pairs of postsutural dorsocentral bristles, one pair of prescutellar acrostichals, and about ten series of short intradorsocentral hairs; anterior sternopleural bristle short; scutellum flattened above. Fore femur without an anteroventral comb; all tibiae with a distinct preapical dorsal bristle. Wings rather narrow, inner cross vein close to middle of discal cell, ultimate section of fourth vein fully twice as long as penultimate section.

Length, 2.5 mm.

Type.—Cat. No. 41131, U.S.N.M. *Type*, and one *paratype* in poor condition, Mount Maquiling, Luzon (C. F. Baker).

The color of the antennae readily separates this species from any now known to me. Usually when the third antennal segment is bicolored in this as in other genera the dark color is on the apical and not the basal portion.

SAPROMYZA OMEI, new species

Female.—Head orange-yellow, opaque except on face and occiput which are slightly shining, ocellar spot velvety black; antennae and palpi not blackened; aristae brown, yellow at bases. Thorax and abdomen shining orange-yellow, not so bright as frons, the abdomen with a large blackish mark on each side of each tergite except the basal one, which gives the dorsum the appearance of having a broad blackish vitta on each side. Wings yellowish hyaline, outer cross vein and apices of veins 2, 3, and 4 conspicuously clouded with fuscous. Legs and halteres yellow.

Frons subquadrate, orbits not differentiated, anterior orbital bristles a little shorter than the posterior pair and much farther from eyes, ocellar bristles short and weak, postverticals long, situated well below vertex; arista pubescent; face flat. Thorax with 1 to 3 pairs of dorsocentrals, the intradorsocentral hairs weak and in four irregular series; sternopleurals both present, the anterior one shortest; scutellum subconvex. Genital papillae enclosed between the glossy chitinous plates which are rounded at apices and emarginate above at some distance from their tips. Fore femur with an anteroventral comb; all tibiae with preapical bristle. Inner cross vein below apex of first vein and at middle of discal cell; ultimate section of fourth vein but little longer than penultimate.

Length, 5 mm.

Type.—Cat. No. 40399, U.S.N.M. *Type* and one *paratype*, Shin Kai Si, Mount Omei, Szechuen, China, 4,000 feet, September 10, 1922 (D. C. Graham).

This species is readily distinguished from others which have the wings marked by the bivittate appearance of the dorsum of abdomen.

Doctor Frey records no species of this genus in his paper but there may be many in the Philippines as they are as a general run much smaller and less conspicuous than the species of the better represented genus *Homoneura*, and are not so likely to be found in general collections.

Genus TRIGONOMETOPUS Meigen

There have been several species of this genus described from the Orient, or at least they have been placed in this genus, and two of these species described from the Philippines are now before me. Doctor Frey recorded these two species also but did not describe any new species, though he described a new genus, *Hendelimyza*, which he placed next to *Trigonometopus*. He makes no mention of the presence or absence of the posthumeral bristle so that it is not possible to make absolutely certain of the identity of his genus. In describing *Hendelimyza* Doctor Frey remarks that it is strange that the genus *Sapromyza*, which is common in the Palearctic and Nearctic regions, and appears to be absent from the Oriental region, should be so well represented in the Australian region, and suggests that some of the numerous species of *Sapromyza* which I have described from the latter region may belong to *Hendelimyza* or an allied genus. If his genus *Hendelimyza* is no closer to *Trigonometopus* than any one of the species described by me from Australia I can not understand why he placed it in his key next to that genus. In fact I should be inclined to consider it merely a *Sapromyza*. If one gives too much weight to variations in the shape of the head, and the chaetotaxy of the thorax, in this family there will be no end to the number of genera erected, with the result that the identification of species will be absolutely impossible.

I present below a key to the species of *Trigonometopus* known to me from the Orient.

KEY TO THE SPECIES

1. Cheek with a series of hairs along middle which extends upward on parafacial almost as far as do the marginal hairs (*Luzonomyza*, new subgenus).
bakeri Bezzi.
- Cheek without hairs on middle..... 2.
2. Thorax with the dorsocentral bristles arranged 1+2.
Neotrigonometopus, new subgenus.
- Thorax with the dorsocentral bristles arranged 0+3 (Subgenus *Trigonometopus* Meigen)..... 3.

3. Arista and its hairs snow white, the hairs quite dense, and longer than usual; wings hyaline, costa fuscous from apex of auxiliary vein to apex of second, the entire marginal cell between these points fuscous, and with three fuscous fasciae from the dark border, one extending over inner cross vein to middle of wing, one over outer cross vein almost completely over wing, and a broad subapical one which leaves only a narrow hyaline fascia between it and the one over outer cross vein, extending from third vein to hind margin, and a narrow white apical border---- *albiseta* Bezzi.
- Arista fuscous, paler at base; wings not marked as above----- 4.
4. Length of frons from posterior ocelli to anterior margin less than equal to its central width; the brown suffusion of wing interrupted by a longitudinal pale line in first posterior cell, and two pale transverse interruptions over apical section of third vein, giving it the appearance of being faintly tripunctate with fuscous; frons with three dark lines.

submaculipennis Malloch.

Length of frons from posterior ocelli to anterior margin about twice as great as its width at center; the brown suffusion of wing becoming gradually less intense from costa to fourth vein, without hyaline interruptions; frons with at most a faint dark central line----- *brunneicosta* Malloch.

TRIGONOMETOPUS SUBMACULIPENNIS Malloch

Trigonometopus submaculipennis MALLOCH, Ent. Mitt., vol. 16, p. 164, 1927.

TRIGONOMETOPUS BRUNNEICOSTA Malloch

Trigonometopus brunneicosta MALLOCH, Ent. Mitt., vol. 16, p. 164, 1927.

The above two species were described by me in a recent paper on Formosan species.

TRIGONOMETOPUS ALBISETA Bezzi

Trigonometopus albiseta BEZZI, Philippine Journ. Sci., vol. 8, p. 317, 1913.

I have seen three specimens of this species from Mount Maquiling, Luzon (C. F. Baker).

LUZONOMYZA, new subgenus

I feel that the possession of but one distinguishing character, even such a one as here mentioned, is insufficient to justify the removal of the species to a distinct genus and consequently have suggested only subgeneric rank for the one under discussion.

Subgenotype.—*Trigonometopus bakeri* Bezzi.

TRIGONOMETOPUS (LUZONOMYZA) BAKERI (Bezzi)

Trigonometopus bakeri BEZZI, Philippine Journ. Sci., vol. 8, p. 318, 1913.

I have before me three specimens of this species from Mount Maquiling, Luzon (C. F. Baker). The hypopygium is as Figure 28.

Typical members of the genus *Trigonometopus* occur in Europe and America. The genotype occurs in Europe.

NEOTRIGONOMETOPUS, new subgenus

This subgenus is erected for the reception of the Australian species *Trigonometopus fuscifrons* Malloch.

As an aid to the identification of the genera most closely related to *Trigonometopus* I append the key below. All the genera lack the posthumeral bristle. Hendel has altered his definition of this bristle to "presutural bristle" in his later papers.

KEY TO THE GENERA

1. Scutellum longer than half the mesonotum, rounded quadrangular, flat convex, sharply margined and celyphuslike projecting over base of abdomen
Celypholauxania Hendel (Neotropical).
 Scutellum normal, not margined nor prolonged..... 2.
2. Postvertical bristles lacking; face with a vertical central keel which is quite sharp on upper part; anterior orbital bristles incurved.
Sauteromyia Malloch.
 Postvertical bristles present; face not keeled..... 3.
3. Anterior orbital bristles incurved..... *Paranomina* Hendel.
 Anterior orbital bristles recurved..... *Trigonometopus* Meigen.
Sauteromyia is known only from Formosa, and *Paranomina* from Australia.

MAQUILINGIA, new genus

Genotype.—*Maquilingia hirticeps*, new species.

This genus is one of the few in the family in which the dorsocentral bristles are arranged 1+2. From the others occurring in the Orient in which the costa is similar to that of *Sapromyza* it may be distinguished by means of the key presented below. The general appearance is quite similar to that of *Paranomina* Hendel, but the posthumeral bristle is present, and consequently it falls in the section containing the Australian genus *Trigonometopsis* Malloch and the Old World genera included in the following key.

KEY TO GENERA

1. Thorax with the anterior pair of dorsocentral bristles in front of suture, and but two postsutural pairs..... 2.
 Thorax with the anterior pair of dorsocentral bristles at or behind suture, and always three postsutural pairs thus present... *Trigonometopsis* Malloch.
2. Thorax with quadriseriate intradorsocentral hairs; postvertical bristles well developed; anterior orbitals not, or very slightly, bent inward; frons longer than wide, copiously haired in front..... *Maquilingia*, new genus.
 Thorax with biseriate intradorsocentral hairs; anterior orbitals bent inward..... 3.
 Thorax with biseriate intradorsocentral hairs; anterior orbitals not bent inward; frons as wide as long, sparsely haired, inner verticals longest.
Kerteszyomyia, new genus.
3. Postverticals very small and weak, far below the ocelli.
Panurgopsis Kertész.
 Postvertical well developed, in normal position frons fully as wide as long, with few hairs in front..... *Ghaetolauxania* Kertész.

The two species known to me may be separated as below.

Frons testaceous, with a complete, narrow, central brown vitta; a pale brown mark between each antenna and eye, which is longer than height of third antennal segment, and a brown mark below each antenna; lower margin of cheek with a rather long bristle about middle, and in front of it numerous short black hairs on entire cheek, which extend above lower level of eye.

hirticeps, new species.

Frons testaceous, with a small fuscous mark on ocellar region; a round chocolate-brown, or black, mark between each antenna and eye, and a similarly colored mark on parafacial suture below each antenna; cheek with three or four long bristles on lower margin, the foremost one at, or close to, lower level of eye, and in front of it two or three fine hairs, none of them on disk of the cheek-----

facialis, new species.

MAQUILINGIA HIRTICEPS, new species

Female.—Yellowish testaceous, slightly shining. Head as described in key. Thorax with two brown vittae along inner margins of the series of dorsocentrals, which are continued over the scutellum, a paler vitta on each side of these behind suture, and a fainter complete one between it and lateral margin, a pale yellow line on exact center of mesonotum and scutellum. Abdominal tergites narrowly dark brown on apices. Wings grayish hyaline. Halteres yellow.

Frons about 1.5 as long as wide at center, quite copiously black haired in front of ocelli, anterior orbitals a little incurved at tips, about two-thirds as long as posterior pair, and about as long as width of third antennal segment; arista with very short pubescence; face slightly receding below; eye about 1.25 as long as high; cheek at bristle about one-third as high as eye. Thorax with 1+2 pairs of long dorsocentrals, four series of intradorsocentral hairs, a pair of prescutellar acrostichals, and the posthumeral, and anterior sternopleural, short. Abdomen tapered apically. Legs normal, the fore tarsi slightly dilated apically. Inner cross vein close to middle of discal cell, penultimate section of fourth vein a little less than half as long as ultimate section; first posterior cell slightly narrowed apically.

Length, 3 mm.

Type.—Cat. No. 41599, U.S.N.M.; Mount Maquiling, Luzon (C. F. Baker).

MAQUILINGIA FACIALIS, new species

Female.—In addition to the distinguishing characters listed in the key this species differs from *hirticeps* in having the frons shorter, about 1.25 as long as wide, and less copiously haired, the orbital bristles longer, the anterior pair being at least 1.5 as long as width of third antennal segment, the eye is more rounded and but little longer than high, the cheek is about one-fourth as high as eye at

middle, the thorax has four brownish vittae, the partial one being absent, and the abdomen is without blackish apices to tergites.

Length, 3 mm.

Type and one paratype.—Mount Maquiling, Luzon (C. F. Baker).

Type.—Female, Cat. No. 41600, U.S.N.M.

An interesting character possessed by both species of this genus is the short, but distinct, bristle on the outer side of basal antennal segment near its lower margin. I have not cited this character in the generic diagnosis as I have but two specimens of the genus and it may not be constant. A similar bristle appears on the basal antennal segment in *Kerteszhomyia*, but it is close to the upper margin of the segment and is much shorter. A similar bristle occurs close to lower margin of basal antennal segment in *Sauteromyia*. There are only the usual microscopic hairs present on basal segment in *Trigonometopus* and these are on upper side, which is also the case in *Trigonometopsis*.

Genus TRIGONOMETOPSIS Malloch

This genus was erected for the reception of an Australian species, *binotata* Macquart. There is one Philippine species which is referable here.

TRIGONOMETOPSIS PUNCTIPENNIS, new species

Female.—Testaceous yellow, Ocellar spot fuscous, frons with a faint brownish central line, two brownish marks at anterior extremity of each orbit, the smaller one between antenna and eye, parafacial browned, face fuscous on upper half; arista pale at base, dark apically. Dorsum of thorax darker than pleura, greasy in the type but with evident traces of four or six brownish vittae and the lateral margins brown, the scutellum with a brown vitta on each side on disk. Apices of tergites narrowly infuscated. Legs yellow. Wings hyaline, brown along costa at base to apex of first vein and with numerous brown spots beyond that point and on disk, four in marginal cell, the last one in apex, the first two more or less evidently subdivided, about nine in submarginal cell, five or six in first posterior cell, the basal one on the inner cross vein, the one at apex faint, and four in second posterior cell, the inner one over outer cross vein. Halteres yellow.

Frons about 1.5 as long as wide, with fine surface hairs, most numerous anteriorly; ocellars small; postverticals below vertex; inner verticals longest; anterior orbitals backwardly curved, shorter than posterior pair; frons in profile slightly projecting; face receding below middle, with a slight central carina above; eye about 1.25 as long as high; cheek longitudinally convex in middle, the bristles not on lower margin of cheek but along lower side of convexity, not

long, and extending to lower extremity of brown part of parafacial; third antennal segment rounded; arista pubescent. Thorax with the anterior pair of dorsocentrals at suture; scutellum flat above; sternopleurals 2. Inner cross vein a little beyond middle of discal cell; apical section of fourth vein about 2.5 as long as preapical.

Length, 3.5 mm.

Type.—Cat. No. 41088, U.S.N.M. Mount Maquiling, Luzon (C. F. Baker).

Genus CHAETOLAUXANIA Kertesz

This genus, which was erected for the reception of a Formosan species, should receive also two species now before me, *Poecilohæterus quadripunctata* de Meijere and *P. sulphuriceps* de Meijere. These species agree in all essential characters with the genotype. The general habitus is similar to that of *Sapromyza*, but the anterior pair of orbital bristles are incurved, there are several conspicuous bristly hairs on anterior part of cheeks, and the dorsocentrals are arranged 1+2. A noteworthy character, though one of color only, lies in the presence in all three species of a conspicuous black spot on upper part of sternopleura.

I present below a key for the separation of the three species.

KEY TO THE SPECIES

1. Face with a black spot in center of lower margin and one between each antenna and eye; thoracic dorsum brown, with a broad blackish central vitta which is overlaid with white dust----- *quadripunctata* (de Meijere).

Face without black spots----- 2.

2. Thoracic dorsum brownish, with two blackish spots in front of suture, and two submedian blackish vittae on its entire length.

sternopleuralis Kertesz.

Thoracic dorsum entirely yellow----- *sulphuriceps* (de Meijere).

I have examined the type specimens of the two species described by Doctor de Meijere, these being sent to me by their describer. None of the species are amongst my material from the Philippines, though it is entirely probable that any, or all, of them occur in the islands. The species are all small, averaging about 3 mm. in length, and the wings are hyaline in all of them.

In Doctor Frey's paper he described a variety of *sternopleuralis* under the name *lineolata*. This variety he distinguishes by a difference of the thoracic vittae, but it is very possible that it is merely an aberration and not a distinct variety. However, I have not seen the specimen, which is from Mindanao.

He also described a new species under the name *tripunctifrons* which is evidently distinct from, though most closely related to *quadripunctata*. It has the ocellar spot and the spot between each antenna and eye black, and the thoracic dorsum with a brown spot

behind each humerus and in the middle two faint brown vittae. It is from Los Banos. Except for the presence of facial spots the description is like that of *sternopleuralis*.

I have seen a specimen which I identify as *spulphuriceps* from Ceylon.

Genus KERTESZOMYIA, new genus

Generic characters.—Head very similar to that of *Panurgopsis* Kertesz, but the eye is more oblong, the anterior orbitals are directed backward, and the face is not protuberant (Fig. 29). Except for the presence of four long strong bristles on lower margin of cheek, the greater length of the upper orbitals as compared with the inner verticals, and the presence of but one sternopleural bristle, the genus is similar to *Sapromyza*. A noteworthy character is the position of the postvertical bristles which are situated far below the vertex, their distance from posterior ocelli being distinctly greater than from ocelli to inner vertical bristles.

Genotype—the following species.

KERTESZOMYIA MACULIFRONS, new species

Female.—Reddish testaceous, thorax and abdomen shining. Frons not shining except at bases of the bristles, with a black spot on ocellar region and one between each antenna and eye; antennae concolorous with head. Thorax and abdomen immaculate. Wings yellowish hyaline. Halteres yellow.

Head in profile as in Figure 29; frons with fine surface hairs anteriorly; face almost flat. Thorax with three pairs of dorso-centrals, the anterior pair well in front of suture, a strong pair of prescutellar acrostichals, and very sparse fine hairs, widely biserial presuturally; scutellum flattened above, subtransverse at apex, with four bristles. Apical bristles on tergites longest on sides. Fore femur without anteroventral comb; all tibiae with distinct preapical dorsal bristle, strongest on mid pair, the latter with one long apical ventral bristle. Inner cross vein a little proximad of middle of discal cell; ultimate section of fourth vein about twice as long as penultimate section; first posterior cell very slightly narrowed apically.

Length, 4 mm.

Type.—Cat. No. 41602, U.S.N.M. Imugin, N. Viscaya (C. F. Baker).

In Hendel's recent key this genus runs down to *Hypagoga*, but the latter has the postverticals close behind ocelli, the ocellar bristles long and strong, first posterior cell widened apically, and differs in other respects.

Genus *TURRIGER* Kertesz

I have some doubts as to the distinctness of this genus from *Cestrotus* Loew. In his recent paper on the genera of Sapromyzidae Doctor Hendel distinguishes them on the character of the frons. I do not concede that the mere lie of the orbital stripes constitutes a valid generic character, there being a great diversity in species of the same genus, the range extending from their being exactly parallel to the eyes, to pronouncedly convergent anteriorly. The presence of the ocelli on the frontal prominence or behind it might have some value, but the degree of elevation of the frons in different individuals of the same species may influence this character. However, it appears to me that there is reason to consider the definition given by Doctor Hendel as subject to emendation as the species before me has the orbital stripes parallel with the eyes, the orbital bristles in longitudinal line, and the ocelli well behind the apex of the frontal prominence. This last character would prevent the location of the species in *Turriger*, but I place it here rather than in *Cestrotus*, the genotype of the latter being African. The Oriental species have the costa as in *Sapromyza*.

TURRIGER FLAVOSCUTELLATUS (de Meijere)

Cestrotus flavoscutellatus DE MEIJERE, Tijdschr. v. Ent., vol. 53, p. 142, 1910.

Originally described in *Cestrotus*.

I have seen Formosan and Javanese specimens of this species, but none from the Philippines.

The Formosan form with dark femora has been named *nigrifemoratus* by Hendel.

TURRIGER FLAVIPES Frey

Turriger flavipes FREY, Acta Soc. pro Fauna et Flora Fennica, vol. 56, No. 8, p. 8, 1927.

This species was described from a single example from Leyte, Philippine Islands. It is distinguished from the preceding species by the differently colored legs, the tibiae and tarsi being entirely yellow, with at most a dark annulus at base of each hind tibia, instead of a dark annulus at base and apex of each pair of tibiae.

Frey suggests the possibility of its being merely a variety of *apicalis* Hendel. I have not seen the species.

Genus *ICHTHYOMYIA* de Meijere

This genus is readily distinguished from any other in the family by the shape of the head. (Fig. 30.) The ocellar bristles are minute and widely divergent, the postverticals are long, both pairs of orbitals are strong, and backwardly directed, the arista is short haired, and the mouth opening occupies less than half the extreme

length of head. In other respects the genus agrees closely with *Sapromyza*, the costa being similar, and the thorax with three pairs of postsutural dorsocentral and two distinct sternopleurals.

The genus is monobasic.

ICHTHYOMYIA CYPRINUS de Meijere

Ichthyomyia cyprinus DE MEIJERE, Tijdschr. v. Ent., vol. 57, p. 382, 1914.

A testaceous colored species, with fuscous markings on head as shown in Figure 30. The throat is largely brownish fuscous, the dorsum gray dusted and with four dark vittae. Femora fuscous. Wings infuscated, hyaline along hind margin.

Habitat, New Guinea.

I have examined the type specimen.

Genus HOMONEURA van der Wulp

This genus contains several well-defined segregates in the Orient, some of them, in my opinion, entitled to subgeneric distinction; and in the following pages I make use of certain characters for distinguishing these segregates, and designate them by names which will serve to separate them from *Homoneura* in the strict sense, the genotype of the latter being *picea* van der Wulp. There is some doubt as to the exact identity of *picea*, as will be shown in the discussion in this paper, but there can be no reasonable doubt that it belongs to the group of species containing *piceoides* and a few related forms included in the following key. Absolute identification must await a thorough examination of the type specimen.

I have in another paper already described some of the subgenera and designated the subgenotypes of these.

There are 143 species included in the following key, 34 being from the Philippines.

KEY TO THE SPECIES ⁶

1. Prealar bristle long and strong, usually over half as long as the bristle behind it; mid tibia with from two to four well-developed posterior bristles, which are usually as long as, or longer than, the tibial diameter (Subgen. *Chaetohomoneura* Malloch)----- 2.
- Prealar bristle undeveloped, only short hairs or setulae in front of the long supra-alar bristle, or if there are bristles present the mid tibia is unarmed----- 9.

⁶ The following key does not include all of the many Philippine species described by Doctor Frey because I have found it impossible to place them in it owing to his omission of many of the important characters made use of herein. I have been able to identify some of the species however amongst those in my possession and they are included, all of them having been identified as new by me prior to his paper appearing. I have given some notes in the text of this paper on his species that remain unidentified by me, and it will undoubtedly be possible for someone to identify them with the key in hand as either additional species or synonymous with some of those included herein. There is no doubt in my mind that there are many species still to be discovered in the Orient, and particularly in the Philippines and the Malay Peninsula. Some Oriental species are figured but not mentioned in the text.

2. Mid femur without strong bristles on any part of posteroventral surface. 5.
Mid femur with strong bristles on part of the posteroventral surface, which
are not longer than the femoral diameter. 3.
3. Prealar bristle less than half as long as the bristle behind it; intra-alar
bristle quite long. anthrax Malloch.
Prealar bristle over half as long as the bristle behind it. 4.
4. Thoracic dorsum yellowish testaceous; male hypopygium as Figure 31.
semibrunnea (de Meijere).
Thoracic dorsum largely blackish; male hypopygium as Figure 32.
umbrosa, new species.
5. Bases of wings distinctly infuscated; hypopygium as Figure 33.
fumibasis Malloch.
Bases of wings not infuscated. 6.
6. Thorax, abdomen, and femora, mostly fuscous. anterior margin of thorax
yellowish; male hypopygium as Figure 34. gedehi (de Meijere).
Thorax and legs testaceous yellow, abdomen shining black; face and frons
largely fuscous. 7.
7. Wings with very slight indications of clouding over the cross veins, and no
dark cloud over any of the other veins apically.
obscuriceps (de Meijere).
Wings with at least the cross veins distinctly clouded, a large fuscous cloud
over apices of second and third veins, and a less elongate cloud over apex
of fourth vein. 8.
8. A more or less evident cloud over lower extremity of inner cross vein, and
the apical clouding less extended basally; hypopygium as Figure 35.
kocki Malloch.
No cloud over inner cross vein, and the apical clouding more extended
basally; male hypopygium as Figure 36. nigrofulva Malloch.
9. Fourth wing vein quite noticeably curved forward at apex (Griphoneu-
roides, new subgenus). 10.
Fourth wing vein not evidently curved forward at apex, usually straight, and
parallel with third, rarely gradually and very slightly convergent with it
on entire apical section. 19.
10. Head black or fuscous; fourth wing vein usually very conspicuously curved
forward at apex (fig. 37). 11.
Head testaceous yellow; fourth vein inconspicuously curved forward at
apex (fig. 38). 17.
11. Antennae entirely black, fuscous, or dark brown. 12.
Antennae yellow, at most with apex of third segment darkened. 14.
12. Thoracic dorsum and scutellum entirely dull testaceous yellow, without any
dark markings; femora black; wings with outer cross vein and apical sec-
tion of veins 2 to 4 faintly margined with brown.
obscuricornis (de Meijere).
Thoracic dorsum with a broad dark central vitta, scutellum red-brown.
darker in middle. astrolabei (Kertész).
Thoracic dorsum with a broad dark central vitta which is not sharply
margined, scutellum dark brown or fuscous at apex, becoming paler
basally. 13.
13. All femora rufous yellow, fore and hind tibiae and all tarsi more brownish;
wings slightly yellowish, outer cross vein and apex of second vein faintly
bordered with yellow; halteres yellow; length 8 mm. wallacei (Malloch).
Legs reddish brown, hind femora and tips of tibiae and tarsi darker;
wings pale yellowish brown tinged, especially on costa, apices of veins
2, 3, and 4, each with a brown spot; knobs of halteres brown; length
6 mm. atricornis (Kertész).

14. Outer cross veins of wing not bordered with brown--- *flavicornis* (Kertesz).
Outer cross vein of wing bordered with brown----- 15.
15. Thorax testaceous yellow, without dark dorsocentral vitta.
distincta (Kertesz).
Thorax testaceous yellow, with a dark dorsocentral vitta----- 16.
16. Legs mostly black-brown----- *fuscipes* (Kertesz).
Legs mostly yellow----- *testaceipes* (Kertesz).
17. Abdomen without paired black spots on apical tergites-- *papuana* (Kertesz).
Abdomen with paired black spots on one or more of the apical tergites-- 18.
18. Fourth tergite with a pair of black spots----- *chyzeri* (Kertesz).
Tergites 4 to 6 each with a pair of black spots, and an additional central
black spot on 4 and 5----- *octoguttata* (de Meijere).
19. Mid tibia with a posterior series of strong setulae or short bristles which
are noticeably longer and stronger than the other tibial hairs----- 20.
Mid tibia with the usual weak regular hairing on posterior side----- 34.
20. Hind tibia without a preapical dorsal bristle; fore tibia in male distinctly
compressed (*Poecilomyza*, new subgenus)----- *boettcheri* (Frey).
Hind tibia with a distinct preapical dorsal bristle; fore tibia in male not
compressed (Subgenus *Neohomoneura* Malloch)----- 21.
21. Ocellar bristles reduced to microscopic hairs; orbital bristles longer and
stronger than usual; a testaceous yellow species, with a broad black central
vitta on thoracic dorsum which extends over scutellum except on the
narrow margin, the abdomen with a similar black dorsal vitta.
aberrans (de Meijere).
Ocellar bristles long, and rather strong----- 22.
22. Anterior sternopleural bristle minute; eye with a very distinct shallow
emargination on lower half of posterior side (fig. 39); wing white, with
a large fuscous mark occupying more than posterior half, but not extending
to base or to apex----- *albicosta*, new species.
Anterior sternopleural bristle well developed; eyes usually not, or but
little, emarginate behind; wings not marked as above----- 23.
23. Wings grayish or yellowish hyaline, without markings----- 24.
Wings yellowish hyaline, with conspicuous brown markings; thorax yellowish
or fulvous testaceous, immaculate; mid and hind femora without
long ventral bristles----- 26.
24. Frons slightly yellowish in center, entirely pale gray dusted, densely so on
the orbits, either of which is as wide as the interfrontalia; thorax fuscous,
with a broad pale gray dusted central stripe as in *viatrix* de Meijere;
apex of scutellum pale testaceous; abdomen testaceous, with a large black
mark on each side of each tergite which leaves only a narrow central
vitta and the apical and lateral margins testaceous; femora black, tibiae
and tarsi testaceous; venter of abdomen of male with many quite long
bristles, the hypopygium rather densely setose--- *setiventris*, new species.
Frons either entirely or partly fuscous; other characters not as above
in their entirety----- 25.
25. Thorax blackish; mid femur with long bristles on posteroventral surfaces;
hind femur with long bristles apically on anteroventral surface.
lugubris (de Meijere).
Thorax testaceous yellow, with two broad fuscous vittae on dorsum, and
two large blackish spots on pleura; mid and hind femora without long
ventral bristles----- *yerburyi*, new species.
26. The dark markings at wing tip extending to extreme apices of veins--- 27.
At least some of the dark marks at wing tip ending before apices of
veins----- 33.

27. Wing markings confined to apices of veins 2, 3, 4, and outer cross vein... 28.
Wing markings conspicuous on costa from apex of first vein, round tip to beyond apex of fourth vein, and at least on outer cross vein..... 29.
28. Markings on apices of veins becoming progressively shorter from second to fourth, the anterior extremity of the one on third vein far beyond the anterior extremity of the one on second (fig. 40); center of propleura with some microscopic black hairs..... *jacobsoni* Malloch.
Markings on apices of veins not becoming progressively shorter, the one on third vein with its anterior extremity in vertical line with anterior extremity of the one on second, or even projecting in front of it (fig. 41); center of propleura bare; hypopygium as Figure 49... *honesta* (Kertesz).
Markings on wings as in *honesta*; center of propleura haired.
indica, new species.
29. Inner cross vein without trace of a dark brown spot or cloud..... 30.
Inner cross vein with a spotlike dark brown mark which does not extend to its costal extremity, the dark brown costal and apical cloud separated from the dark mark on outer cross vein by a broad clear area (fig. 42).
limbifera (de Meijere).
30. Costal cloud beginning distinctly beyond apex of first vein; frons not darkened 31.
Costal cloud beginning at apex of first vein; frons distinctly darkened above..... 32.
31. Center of propleura with some microscopic black hairs; costal cloud beginning almost above inner cross vein; no clear marks in apical cloud.
macgregori, new species.
Center of propleura bare; costal cloud beginning distinctly beyond inner cross vein; a small subtriangular clear mark on costa between apices of second and third veins, and another, less distinct, between apices of third and fourth..... *incompleta*, Malloch.
32. Costal cloud connected with the one over outer cross vein (fig. 43).
orientalis (Wiedemann).
Costal cloud not connected with the one over outer cross vein.
karnyi Malloch.
33. The dark spot on ultimate section of third vein remote from apex, immediately below the one near apex of second, sometimes fused with it (fig. 44).
paroeca (Kertesz).
The dark spot on ultimate section of third vein almost, or quite, extending to apex of vein, and much beyond that close to apex of second vein (fig. 45)..... *nigronotata* (Kertesz).
34. Thorax with the anterior pair of dorsocentral bristles very obviously proximal of the suture and only two pairs behind same; face at lower margin about three times as wide as height of cheek (Subgenus *Euhomoneura* Malloch..... 35.
Thorax with bristles as in *Euhomoneura*; face at lower margin, and height of cheek, equal (Subgenus *Xenohomoneura* Malloch.... *testacea* Malloch.
Thorax with the dorsocentrals behind suture always in three pairs..... 38.
35. The dark mark on outer cross vein connected broadly with the one in anal field (fig. 46); antennae black, conspicuously white on base of third segment around arisal insertion..... *nigriflua*, new species.
The dark mark on outer cross vein not connected with those in anal field... 36.
36. The dark mark on outer cross vein not extending over fifth vein, nor to apex of same (fig. 47)..... *lunata* (de Meijere).
The dark mark on outer cross vein extending over fifth vein to margin of wing and apex of vein..... 37.

37. Basal segment of antenna yellow----- *lunipennis* (de Meijere).
 Basal segment of antenna gray----- *ornatipennis* (de Meijere).
38. A distinct, but short, intraalar bristle present; arista short haired, sometimes merely pubescent; frons very distinctly longer than wide (Subgenus *Minettioides* new.)----- 39.
 No intra-alar bristle present; hairing of arista variable; frons almost invariably about as wide as long (Subgenus *Homoneura* van der Wulp). 43.
39. Wings conspicuously browned, most deeply so along costa, the brown color gradually decreasing in intensity posteriorly, the cross veins slightly darker than field of wing; brownish testaceous species, without black spots on abdomen; hairs on arista about half as long as width of third antennal segment----- *fumipennis* (Malloch).
 Wings not at all browned; abdomen with at least one pair of black spots near apex; hairs on arista not nearly half as long as width of third antennal segment----- 40.
40. Species with at most two pairs of black abdominal spots----- 41.
 Species with at least three pairs of black abdominal spots----- 42.
41. Slender species, with the frons a little over 1.5 as long as wide at anterior margin; face almost flat; thorax entirely testaceous; hypopygium as Figure 50----- *parvinotata* (de Meijere).
 Robust species, with the frons fully twice as long as wide at anterior margin; face distinctly elevated just above mouth; sternopleura largely fuscous----- *crassiuscula* (de Meijere).
42. Fore femur without anteroventral comb----- Samoan sp. 1.⁷
 Fore femur with anteroventral comb----- Samoan sp. 2.⁷
43. Arista pubescent, the hairs much shorter than half the width of third antennal segment; wings without dark markings even at base; halteres pale (cf. *trifasciata*, 77)----- 44.
 Arista as above; halteres fuscous: glossy black species with two pairs of acrostichals----- Samoan sp. 3.
 Arista with very conspicuous hairs, if short haired the wings are marked. 54.
44. Black species, with, or without, a small proportion of yellow or whitish color on some part of the body, the abdomen always entirely black. 45.
 Yellow species, thorax sometimes grayish, abdomen yellow, with one or two pairs of black dorsal spots, and sometimes dark fasciae on tergites--- 48.
45. Scutellum fuscous, apex conspicuously gray dusted.
 piliseta, new name (= *pubiseta* (de Meijere), not Kertész).
 Scutellum uniformly brownish gray dusted----- 46.
46. Ocellar bristles a little longer than anterior orbitals; species not over 2 mm. in length, with frons dull sulphur-yellow on interfrontalia above, and on entire width in front of anterior orbitals; wings narrower than usual, outer cross vein at about its own length from apex of fifth vein.
 exigua (de Meijere).
 Ocellar bristles much shorter and weaker than anterior orbitals; species at least 3 mm. in length; frons brownish centrally; outer cross vein at much less than its own length from apex of fifth vein----- 47.
47. Species 3 mm. in length; orbital stripes dull, densely pale gray dusted, each at upper bristle not over one-third as wide as interfrontalia at same point----- *coffeata* (de Meijere).

⁷ These species from Samoa included in this key to show their relationships, were received from Dr. P. A. Buxton. They will be described elsewhere.

- Species 5 mm. in length; orbital stripes shining, not densely gray dusted, only visibly so when viewed from behind, each at upper bristle almost as wide as interfrontalia at same point..... nudiseta (Kertesz).
48. Thorax with only the prescutellar pair of strong acrostichals behind suture..... 49.
Thorax with at least one pair of well developed acrostichals behind suture in addition to the prescutellar pair..... 52.
49. Thorax largely fuscous and quite densely gray dusted, abdomen with a fuscous fascia at middle of at least the third and fourth tergites; hypopygium as Figure 51..... hawaiiensis Malloch.
Thorax entirely testaceous; abdomen without fuscous fasciae..... 50.
50. Abdomen without paired black dorsal spots apically; hypopygium as Figure 52..... curta, new species.
Abdomen with at least one pair of black dorsal spots apically..... 51.
51. Black spots on fifth tergite large, extending almost the entire length of the exposed part of tergite; hypopygium as Figure 53.. nudifrons (Kertesz).
Black spots on fifth tergite small, opaque; hypopygium as Figure 54.
crassicauda Malloch.
52. Thorax with one presutural and four postsutural pairs of widely separated acrostichals; abdomen with a central spot, and transverse lateral marks black on apices of tergites except the basal two.. diacrostichalis Malloch.
Thorax with or without presutural acrostichals, if there are any such present they are weak, and close to suture; abdomen without transverse black apical marks on tergites..... 53.
53. Extreme lateral edges of fifth and sixth abdominal tergites furnished with dense short black spinules; hypopygium as Figure 55; abdomen with three small black spots on fifth tergite..... acrostichalis (de Meijere).
No dense short black spinules on extreme lateral edges of any of the abdominal tergites; hypopygium as Figure 56; abdomen with a pair of large black spots on sides of fifth tergite..... philippinensis, new species.
No short black spinules on edges of tergites; hypopygium as Figure 57; abdomen with three spots on fifth tergite..... pubiseta Kertesz.
54. Fifth wing vein thickened for a short distance at base of discal cell, and with microscopic hairs on thickened part; testaceous yellow species with a series of black spots on middle of tergites of apical half of abdomen..... 55.
Fifth wing vein normal at base..... 57.
55. Wing with a dark brown costal cloud, less distinct proximad of apex of first vein, which extends almost to third vein up to a point almost above outer cross vein, from there extending into first posterior cell and over almost entire apex of wing, leaving a small clear patch in first posterior cell just beyond outer cross vein on the fourth vein, and connecting with a dark spot on upper extremity on outer cross vein.. costalis, new species.
Wing without a dark brown costal cloud, at most the apices of the second, third, and fourth veins clouded beyond level of outer cross vein..... 56.
56. Apices of veins 2, 3, and 4 quite distinctly clouded with brown; hypopygium as Figure 58..... padangensis (de Meijere).
Apex of second wing vein quite distinctly clouded, those of veins 3 and 4 not noticeably clouded; hypopygium as Figure 59.. intermedia, new species.
Apices of veins 2, 3, and 4 not noticeably clouded; hypopygium as Figure 60.
horni, new species.

57. Ocellar bristles reduced to microscopic hairs, the orbital bristles very long and strong, the upper one longer than height of head, the anterior pair a little wider apart than upper pair, no distinction between orbital stripes and remainder of frons, all shining; a glossy fulvous yellow species with five black marks on dorsum of thorax, the one on each side at middle filling all of length between humeral callosity and base of wing, and quadrate in shape, the posterior pair covering basal angles of scutellum as well as a small portion of posterior lateral angles on mesonotum; sides of abdomen broadly black vittate; wings immaculate.
maculifera (de Meijere).
- Ocellar bristles well developed, extending to at least middle of frons; species not colored as above----- 58.
58. Mid tibia abnormally haired; preapical dorsal bristle on fore tibia abnormally long and slender, extending to, or almost to, apex of basal segment of tarsus (males)----- 59.
- Mid tibia without abnormal hairing; preapical dorsal bristle on fore tibia very much shorter than basal segment of fore tarsus, and usually rather stout----- 60.
59. Mid tibia with very fine curled hairs on apical third of posteroventral surface which are no longer than tibial diameter; hind femur without outstanding anteroventral bristles----- *crinita*, new species.
- Mid tibia with dense straight bristly hairs on entire length of posterior surface, which are much longer than the tibial diameter, and dense short fine hairs on ventral surfaces; hind femur with a series of fine bristles from base to middle on anteroventral surface, longest apically.
hirtitibia, new species.
60. Wings without conspicuous markings, rarely with the extreme bases infuscated, or the outer, or both cross veins, slightly clouded----- 61.
- Wings with a faint, but evident, pale yellowish clouding along the longitudinal veins and on outer cross vein; head entirely black; thorax and abdomen brownish testaceous, dorsum of former, and basal four tergites of latter, black; knobs of halteres dark brown; hypopygium as Figure 61.
strigipennis (de Meijere).
- Wings with quite evident dark markings in addition to any at extreme bases or over the cross veins----- 107.
61. Extreme bases of wings infuscated; black species, with the knobs of halteres black; thorax with a trace of white dusting round anterior spiracle, and on anterior margin of mesonotum----- 62.
- Bases of wings not infuscated----- 65.
62. Superior claspers of male hypopygium with three or more short teeth or points projecting at right angles (fig. 62)----- *dentifera*, new species.
- Superior claspers of male hypopygium with at most two processes, which both project downward----- 63.
63. Hypopygium with two pairs of large black equal-sized processes, one directed forward, the other backward (fig. 63)----- *opposita* Malloch.
- Hypopygium with the forwardly directed pair of processes much smaller than the other----- 64.
64. Inner process of superior clasper slender, with a rounded apex (fig. 64).
maquilingensis, new species.
- Inner process of superior clasper stouter, acute at apex (fig. 65).
trispina Malloch.
- Inner process of superior clasper leaflike (fig. 66)----- *folifera* Malloch.

65. Thorax and abdomen black; halteres dull yellow, with black knobs----- 66.
 Thorax and abdomen more or less yellow, but the halteres pale even if these parts are largely, or entirely, black----- 69.
66. Thoracic dorsum dull, evenly and densely brownish gray dusted; frons entirely fuscous, and not shining either on triangle or orbital stripes; intradorsocentral hairs in six series----- *opacithorax* Malloch.
 Thoracic dorsum, and at least the frontal triangle and orbital stripes, distinctly shining, the thorax without dusting on disk; intradorsocentral hairs in at least eight series----- 67.
67. Inner cross vein but little, if any, proximad of middle of discal cell; outer cross vein at less than twice its own length from inner; tibiae largely testaceous yellow----- *signatifrons* (Kertész).
 Inner cross vein very conspicuously proximad of middle of discal cell, sometimes at one-third from its base; outer cross vein at more than twice its own length from inner; tibiae largely darkened----- 68.
68. Ocellar bristles little shorter than anterior orbitals; male hypopygium as Figure 67----- *piceoides*, new species.
 Ocellar bristles much shorter and weaker than anterior orbitals; male hypopygium as Figure 68----- *nigrita*, new species.
69. Thorax with three or four pairs of strong acrostichal bristles----- 70.
 Thorax with only the prescutellar pair of acrostichal bristles developed-- 71.
70. Head, thorax, and abdomen, shining testaceous yellow, the abdomen with a pair of round black spots on fourth visible tergite; anterior pair of acrostichals presutural; anterior orbitals much longer and stronger than ocellars----- *luzonensis*, new species.
 Head and thorax partly, abdomen entirely, black; anterior pair of acrostichals just behind suture; anterior orbitals a little shorter than ocellars. *robusta*, new species.
71. Hind tibia lacking the preapical dorsal bristle; anterior orbital bristle rarely over half as long as posterior one; third antennal segment blackened at apex; shining fulvous yellow species----- 72.
 Hind tibia with a distinct preapical dorsal bristle, sometimes quite short----- 78.
72. A conspicuous black mark at base of scutellum; anterior orbital bristle about one-third as long as posterior one----- 73.
 No black mark at base of scutellum; anterior orbital bristle over one-third as long as posterior one----- 77.
73. Face entirely deep black from eye to eye----- *atriceps*, new species.
 Face entirely yellow----- 74.
74. Thorax with two submedian fuscous vittae which begin behind anterior margin, and connect with the black mark on base of scutellum; mid femur with some long fine bristles on basal half of posteroventral surface, and hind tibia with a sharp carina on dorsal surface apically in male; hypopygium as Figure 69----- *bilineella* (Frey).
 Thorax without fuscous dorsal vittae, posterior margin of mesonotum black centrally, the black color connected with the black basal mark on scutellum----- 75.
75. Palpi black at apices; outer cross vein of wing quite distinctly clouded; mid femur in male with some long fine bristles on basal half of posteroventral surface; hind tibia of male with a sharp carina on dorsal surface apically; hypopygium as Figure 70----- *nothostiota* (Frey).
 Palpi entirely yellow; outer cross vein not at all clouded; mid femur in male without long posteroventral bristles; hind tibia not sharply carinate on dorsum in either sex----- 76.

76. Male hypopygium as Figures 71 and 72; Formosan species.

notostigma (Kertesz).

Male hypopygium as Figures 73 and 74; Javanese species.

demeijerii, new species.

77. Frons with an opaque black triangular mark between anterior portion of each orbital stripe and eye; only the outer cross vein clouded; anterior orbital fully half as long as posterior one; hypopygium as Figure 75.

bakeri, new species.

Frons without anterior triangular black marks; both cross veins slightly clouded; anterior orbital not fully half as long as posterior one; hypopygium as Figure 76----- *leucoprosopon* (de Meijere).

78. Thorax largely, or entirely, black or fuscous, never yellow on disk, and often densely gray dusted at least in part; apex of scutellum always very distinctly paler than base, generally stramineous, except in *toxopeus*----- 79.

Thorax testaceous or fulvous yellow, the ground color never obscured by grayish dusting; apex of scutellum not paler than its base----- 85.

79. Prescutellar acrostichals microscopic, usually almost indistinguishable; thorax and abdomen shining black, almost devoid of dusting; humeri yellowish; apex of scutellum broadly yellowish; palpi and mid and hind femora largely fuscous----- *ornatifrons* (de Meijere).

Prescutellar acrostichals conspicuously developed; thorax not shining black, with dense grayish or whitish dusting----- 80.

80. Frons, and center of thoracic dorsum, including that of scutellum, with dense whitish gray dusting, the whole forming a broad pale vitta which is bordered on each side by a narrower dark brown vitta on thorax, between which vittae and the lateral dark margins there is another linear whitish vitta; pleura gray dusted, with two dark brown vittae; face fuscous, gray dusted; palpi and femora almost entirely black; tibiae and tarsi yellow----- *viatrix* (de Meijere).

Frons distinctly bicolored, yellow and black, or gray; dorsum of thorax not vittate, densely gray dusted all over; pleura not vittate; palpi and femora yellow----- 81.

81. Abdomen testaceous yellow, with black or fuscous markings at apices of tergites; legs testaceous, hind tibiae with a dark incomplete subbasal band; outer cross vein narrowly and faintly clouded----- 82.

Abdomen dark gray, without spots, the apices of tergites very narrowly yellow; outer cross vein not clouded; face testaceous----- 84.

82. Scutellum not pale on margin; face yellow; pteropleura and mesopleura largely black----- *toxopeus* Malloch.

Scutellum distinctly pale on margin----- 83.

83. Face with a gray transverse band or pair of spots near middle; abdomen with a central series of elongate black marks, and on each side a transverse black apical mark on each tergite except basal and apical; hypopygium as Figures 77, 78; apex of fifth tarsal segment blackened.

beckeri (Kertesz).

Face testaceous; each abdominal tergite except basal and apical with a complete black apical fascia which is carried forward triangularly at middle; upper half of occiput yellowish testaceous; male hypopygium as Figure 79; apex of fifth tarsal segment blackened--- *fasciventris* Malloch.

Face with a fuscous mark near middle as in *beckeri*; abdominal tergites marked as in *fasciventris*; upper half of occiput with a large fuscous mark on each side; hypopygium as Figure 80; fifth tarsal segment pale.

occipitalis Malloch.

84. Frons dull gray, yellow in front; legs stramineous, a brownish mark at apex of fore tibia on posterior side, and another near base of hind tibia on ventral side----- *immaculata* (de Meijere).
 Frons ochreous yellow, only the orbital stripes and ocellar region gray; legs stramineous, fore femur with a brownish preapical mark on anterior side along the bases of the anteroventral comb of setulae.
circumcincta (Frey).
85. Longest hairs on arista not over half as long as width of third antennal segment; abdomen with a large black mark at apex on each side of each tergite except the basal two, which is broadest at inner extremity and tapers off outwardly, the inner extremities quite widely separated; ocellar bristles weak and short, hardly more than half as long as anterior orbitals; cross veins of wings not clouded----- *trifasciata* (de Meijere).
 Longest hairs on arista at least as long as width of third antennal segment; abdomen with one or two pairs of black spots, with some of the tergites tripunctate, quadripunctate, or all impunctate----- 86.
86. Abdomen with some distinct round, or subquadrate, black spots on at least one of the tergites, usually the fifth----- 87.
 Abdomen without distinct black spots on tergites, sometimes with a faint central vitta or suffusion----- 95.
87. Neither of the cross veins very evidently clouded----- 88.
 At least the outer cross vein of wing quite noticeably clouded, not conspicuously so----- 92.
88. Abdomen with three black spots on fifth tergite and five on sixth; ocellar bristles as long as anterior orbitals; hypopygium as Figure 81.
immaculipennis, new species.
 Abdomen without a central black spot on fifth and sixth tergites, but with two or four such spots on at least the fifth----- 89.
89. Ocellar bristles as long as anterior orbitals; penultimate section of fourth vein fully two-thirds as long as ultimate----- 90.
 Ocellar bristles much shorter than anterior orbitals; penultimate section of fourth vein but little over half as long as ultimate----- 91.
90. Abdomen with a pair of black spots on fifth tergite and another on sixth, and in addition a spot on lateral margin of each of these tergites.
signata (van der Wulp).
 Abdomen with a pair of black spots on fifth tergite, none on sixth or on lateral margins of either fifth or sixth----- *neosignata*, new species.
91. Third antennal segment entirely yellow----- *bioculata* (de Meijere).
 Third antennal segment infuscated on apical half-- *kerteszi* (de Meijere).
92. Abdomen with a median black spot on fifth and sixth tergites, and two pairs of similar spots on each side of it, the outer one on lateral margin, the submedian one on sixth tergite very small, subobsolete; uppermost hair in the series on lower part of sides of face much stronger and longer than the others----- *mediosignata* (Frey).
 Abdomen without median black spot on fifth and sixth tergites, the spots submedian and paired----- 93.
93. Abdomen with but one pair of shining black spots; mid femur in male with a series of long hairs on posteroventral surface which are fine at base and become bristlelike beyond; apices of longitudinal veins very slightly browned, that of second most obviously so.
biguttata (Macquart).
 Abdomen with two pairs of black spots; mid femur of male without long posteroventral hairs or bristles; apices of veins not clouded----- 94.

94. Inner cross vein and round extreme margin of wing tip slightly clouded.
halterata (Kertész).
Inner cross vein and margin of wing tip not clouded.
novaeguineae (Kertész).
95. Thoracic dorsum with eight or ten series of short intradorsocentral hairs ----- 96.
Thoracic dorsum with six or less series of short intradorsocentral hairs 101.
96. Tergites of apical half of abdomen with a black dorsocentral spot or vitta,
and all except the rudimentary basal and apical tergites with a complete
narrow black apical fascia ----- biroi (Kertész).
Tergites without distinguishable black markings, sometimes apex of abdo-
men dark ----- 97.
97. One or two of the setulae just in front of the supra-alar bristle usually as
long as those on tegula; anterior one of the three apical ventral bristles
on mid tibia but little shorter than middle one; apical bristles on fifth
tergite in female shorter and weaker than those on fourth; no outstand-
ing setula at upper extremity of the series of hairs on lower part of
sides of face ----- 98
No outstanding setulae in front of supra-alar bristle, the longest hairs
much shorter than longest setula on tegula; anterior one of the ventral
bristle on mid tibia not half as long as middle one; apical bristles on
fifth tergite not noticeable shorter nor weaker than those on fourth -- 100.
98. Outer cross vein slightly but distinctly clouded; abdomen not infuscated
on apical half; hypopygium as Figure 83 ----- grossa (de Meijere).
Outer cross vein not at all clouded; abdomen infuscated on apical half. 99.
99. Hypopygium as Figure 84 ----- fuscobrunnea, new species.
Hypopygium as Figure 85 ----- nigroapicata Malloch.
100. An outstanding setula at upper extremity of the series of fine hairs on
lower part of sides of face; anterior orbital bristle about three-
fourths as long as posterior one ----- simplissima (de Meijere)
No outstanding setula on lower part of sides of face, the fine hairs of
almost uniform length; anterior orbital bristle as long as posterior one;
hypopygium as Figure 86 ----- sauteri Malloch.
No outstanding bristle on lower part of sides of face; hypopygium as
Figure 84 ----- fuscobrunnea Malloch.
101. Apical third or more of third antennal segment deep black ----- 102.
Antennae entirely yellow ----- 103.
102. Anterior orbital bristle less than half as long as posterior one; hypopygium
as Figure 87 ----- affinis, new species.
Anterior orbital bristle more than half as long as posterior one; hypopy-
gium as Figure 88 ----- sublucida, new species.
103. Outer cross vein distinctly, but inconspicuously, clouded with brown;
anterior orbital fully half as long as posterior; hypopygium as Figure 89.
laticosta (Thomson).
Outer cross vein of wing not clouded ----- 104.
104. Anterior orbital bristle less than half as long as posterior one; sides of
face slightly white dusted; hypopygium as Figure 90.
lucida (de Meijere).
- Anterior orbital bristle over half as long as posterior one ----- 105.
105. Sides of face when seen from above very conspicuously white dusted,
silvery; hypopygium as Figure 91 ----- unguiculata (Kertész).
Sides of face not, or very little, white dusted ----- 106.

106. Mid tibia with one long apical ventral bristle, the other two bristles reduced to very short setulae; hypopygium as Figure 92.

pallidula Malloch.

Mid tibia with two long apical ventral bristles, the posterior one but little shorter than the middle one, the anterior one reduced to a short setula; hypopygium as Figure 93..... *diversa* (Kertész).

107. Thorax with strong acrostichals from before suture to hind margin of mesonotum, three or four pairs in all; wing marked as Figure 48; hypopygium as Figure 94..... *geomyzina* (Frey).

Thorax with only the prescutellar acrostichals well developed, if with more than the wings black, with many small white or hyaline spots..... 108.

108. Wings blackened or browned on costa to, or almost to, apex of fourth vein, the dark color becoming gradually less intense posteriorly, not extending to hind margin of wing, the outer cross vein usually without a conspicuous, separated, dark clouding..... 109.

Wings with clearly defined, isolated, or connected, dark markings, and interspersed clear areas, in front of fourth vein, the outer cross vein always with a conspicuous dark mark..... 113.

109. Arista almost bare..... *grahami*, new species.

Arista plumose or at least with distinct hairs..... 110.

110. Small species, about 3 mm. in length; thorax with six series of intradorsocentral hairs; wings faintly clouded, the outer cross vein with a faint isolated cloud; hypopygium as Figure 89..... *laticosta* (Thomson).

Larger species; thorax with 8-10 series of intradorsocentral hairs; wings conspicuously clouded..... 111.

111. Longest hairs on arista about one-fourth as long as width of third antennal segment; species less than 5 mm. in length; a pale streak in discal cell and another pale mark in first posterior cell near middle.

discoidalis (Kertész).

Longest hairs on arista about one-half as long as width of third antennal segment..... *fumipennis* Malloch.

Longest hairs on arista as long as width of third antennal segment; species at least 5 mm. in length; no pale streak in discal cell..... 112.

112. A pale line along hind margin of costal vein; abdomen pitchy black; femora darker than tibiae and tarsi; hypopygium as Figure 95.

dichroa (de Meijere).

No pale line along hind margin of costal vein; abdomen testaceous yellow, with narrow dark hind margins to tergites; legs yellow.

nigripennis (de Meijere).

113. Wings blackish or fuscous, with many small hyaline round spots on disk, and subtriangular, or oblong, hyaline spots round margins; second vein farther from costa than usual, the marginal cell opposite outer cross vein wider than submarginal at same point; one or more pairs of the acrostichals besides the prescutellar pair rather conspicuous..... 114.
- Wings hyaline, with dark markings, the pale marks on disk not consisting of numerous small round hyaline spots, and most of the margins hyaline; second vein in normal position, the marginal cell never wider than submarginal opposite outer cross vein; no conspicuous acrostichals except prescutellar pair..... 115.

114. Outer cross vein very oblique, forming an almost continuous line with apical section of fifth vein, and with a small hyaline spot close against each side of it near its inner extremity; penultimate section of fourth vein a little over as long as ultimate; abdominal tergites each with several large gray dusted spots on anterior margin, and a series of small similarly colored spots along hind margin; all femora with a narrow fuscous annulus beyond middle which is incomplete above.

trypetoptera (Hendel) (= *histrio* de Meijere).

Outer cross vein less oblique, and without a pale spot close against each side near inner extremity; penultimate section of fourth vein about four-fifths as long as ultimate; all tergites with the large anterior gray-dusted spots, which are rather irregular, but without the small pale hind marginal spots; all femora darkened basally, fore pair least broadly so..... *picta* (de Meijere).

115. Face testaceous, with two conspicuous round dark spots; thorax testaceous yellow, dorsum with five fuscous vittae, the middle one broad, and extending over scutellum except narrowly on margin; entire costa dark brown, the dark color extending to middle of submarginal cell and connecting with the spots on third vein..... 116.

Face either testaceous or fuscous, but without a pair of conspicuous round dark spots; dorsum of thorax without five conspicuous fuscous vittae 118.

116. Wing with a hyaline spot at apex of third vein on its upper side in addition to the larger one on under side at apex of second vein.

quinquevittata var. *formosana* Malloch.

Wing without a hyaline spot at apex of third vein on its upper side, only the large one on under side of apex of second vein present..... 117.

117. Pleura with a complete dark vitta across middle; the clear spot at apex of first posterior cell conspicuous between apices of third and fourth veins; hypopygium with the process at apex of each lateral arm of basal tergite short and conspicuously hooklike..... *quinquevittata* (de Meijere).

Pleura with three dark spots along middle; the clear mark at apex of first posterior cell reduced to a mere line on margin; hypopygium with the process of each lateral arm of basal tergite straight, rather long, and very slightly clavate at apex..... *pleuripuncta* Malloch.

118. Wing with a dark mark on third vein beyond level of inner cross vein, in addition to the one at apex of the vein..... 119.

Wing without a dark mark on third vein beyond inner cross vein in addition to the one at apex of the vein..... 132.

119. Three dark marks on third vein beyond inner cross vein in addition to the one at apex of the vein; arista plumose..... 120.

Two dark marks on third vein beyond inner cross vein in addition to the one at apex of the vein..... 121.

One dark mark on third vein beyond inner cross vein in addition to the one at apex of the vein..... 127.

120. The spot on second wing vein elongate, covering at least half the length of vein beyond apex of first vein, but not extending to tip of vein; some, or all, of the dark spots on third vein connecting with the dark marks on second and fourth veins; apex of cell between auxiliary and first veins fuscous; thorax testaceous, dorsum gray dusted, and with four narrow dark brown vittae, the area between the submedian pair grayish; third antennal segment darkened apically; disk of scutellum dark brown or fuscous; frons longer than wide..... *caloptera* (Kertész).

129. The downwardly projecting process on tergite which forms the basal portion of hypopygium with a fine thornlike tip (fig. 96).
chinensis Malloch.
 The downwardly directed process of this tergite rounded at tip.
grandis (Kertesz).
130. No dark mark over apices of auxiliary and first veins, and none basad of the one on inner cross vein; the dark streak on apical portion of second vein extending to tip of vein..... *varinervis* (Kertesz).
 A dark mark over apices of auxiliary and first veins, which connects with the one on inner cross vein; the dark streak on apical portion of second vein not extending to tip of vein..... 131.
131. The dark spot on fourth vein not extending basad on vein farther than the one on apex of third vein; apex of third antennal segment broadly infuscated; no dark lines on face; fourth vein not clouded basad of inner cross vein..... *bistriata* (Kertesz).
 The dark spot on fourth vein extending much farther basad on vein than the one on apex of second; third antennal segment yellow; a dark transverse line near lower margin of face, and one on each side on suture between parafacial and central part of face; fourth vein with the base of antepenultimate section conspicuously clouded.
striatifrons (de Meijere).
132. The dark wing markings consisting of clouds over one or both cross veins, elongate clouds on apices of veins 2, 3, and 4, these latter fused into a single cloud, and this sometimes carried basad along costa even to base of wing..... 133.
 The dark wing markings consisting of isolated clouds on one or both cross veins, and on apices of veins 2 to 4, and rarely on costa between apices of auxiliary and first veins..... 135.
133. The cloud on apex of second vein not extending basad of level of outer cross vein; both cross veins distinctly clouded; abdomen with a pair of black transverse marks on apices of two or three of the apical tergites, and the sides of the hypopygium black..... *beccari* (Kertesz).
 The cloud on second vein extending well basad of level of outer cross vein..... 134.
134. The cloud on second vein extending basad almost to level of inner cross vein, but falling distinctly short of apex of first vein; inner cross vein not clouded, the outer one faintly suffused..... *lorentzi* (Kertesz).
 The cloud on second vein extending basad of apex of auxiliary vein, much narrowed in costal cell; both cross veins distinctly clouded.
*vankampen*i (de Meijere).
135. Third antennal segment deep black on apical third; palpi yellow; anterior orbitals barely half as long as posterior pair, and a little wider apart; longest hairs on arista fully as long as width of third antennal segment; intradorsocentral hairs in at least eight series; preapical dorsal bristle on hind tibia not, or very slightly, longer than the apical curved anteroventral spur, and close to apex; thorax entirely yellow, shining..... *quinquenotata* (de Meijere).
 Third antennal segment entirely yellow, or very slightly darkened apically; anterior orbitals but little shorter than posterior pair, and slightly closer together at bases; intradorsocentral hairs in six series; preapical dorsal bristle on hind tibia much longer than the apical spur; thorax grayish dusted and opaque..... 136.

HOMONEURA (CHAETOHOMONEURA) SEMIBRUNNEA (de Meijere)

Lauxania semibrunnea DE MEIJERE, Tijdschr. v. Ent., vol. 58, p. 91, 1915.

This species is very similar to the preceding one, the only characters for their separation consisting of the color of the thorax, which may be variable, and the structure of the male hypopygium (fig. 31).

I have seen only a Sumatran specimen sent to me by Doctor de Meijere.

HOMONEURA (CHAETOHOMONEURA) GEDEHI (de Meijere)

Lauxania gedehi DE MEIJERE, Tijdschr. v. Ent., vol. 57, p. 231, 1914.

The specimen of this species sent to me by Doctor de Meijere is greasy, but the color is evidently normally darker than in *obscuripes* de Meijere. I have drawn the male hypopygium as it is evident on the specimen without dissection (fig. 34); the very long lateral extension of the basal portion should be a good character for the recognition of the species.

Habitat.—Java.

HOMONEURA (CHAETOHOMONEURA) OBSCURICEPS (de Meijere)

Lauxania obscuriceps DE MEIJERE, Tijdschr. v. Ent., vol. 67, p. 50, 1924.

The type specimen before me is a female. I note that there is a faint brown suffusion on the outer cross vein and the apices of veins 2 to 4, inclusive, most distinct on second vein, but the grassy condition of the wings in *gedehi* prevents me from distinguishing if this clouding is present in it also.

Locality.—Sumatra.

HOMONEURA (CHAETOHOMONEURA) NIGROFULVA Malloch

Homoneura (Chaetohomoneura) nigrofulva MALLOCH, Suppl. Ent., vol. 15, p. 106, 1927.

HOMONEURA (CHAETOHOMONEURA) KOCKI Malloch

Homoneura (Chaetohomoneura) kocki MALLOCH, Suppl. Ent., vol. 15, p. 106, 1927.

HOMONEURA (CHAETOHOMONEURA) ANTHRAX Malloch

Homoneura (Chaetohomoneura) anthrax MALLOCH, Suppl. Ent., vol. 15, p. 107, 1927.

HOMONEURA (CHAETOHOMONEURA) FUMIBASIS Malloch

Homoneura (Chaetohomoneura) fumibasis MALLOCH, Suppl. Ent., vol. 15, p. 107, 1927.

The above four species were described in the paper in which the subgenus was described, as above noted. All are from Sumatra. The hypopygium of *fumibasis* is shown in Figure 33, of *kocki* in Figure 35, of *nigrofulva* in Figure 36.

GRIPHONEUROIDER, new subgenus

I erect this subgenus for the reception of those species from the Orient which have been heretofore placed in *Griphoneura*, and include with them three others described as species of *Sapromyza* and *Lauxania*. I distinguish the subgenus from *Griphoneura* by the costal armature, which in the latter is similar to that of *Sapromyza*, by the presence of a fore femoral comb. and the long ocellar bristles. There is a flattened area on the posterior surface of the fore metatarsus of the males of the genus *Griphoneura* which I have examined that is not present in any male of *Griphoneuroides* I have seen. The apex of the wing of the subgenotype is shown in Figure 37.

Subgenotype.—*Griphoneura testaceipes* Kertész.

The included species occur mostly in New Guinea, but *wallacei* Malloch is from Mysol, and it may be that some species will yet be found in the Philippines.

POECILOMYZA, new subgenus

This subgenus is distinguished by the presence of several short bristles on the posterior side of mid tibia, the absence of the pre-apical dorsal bristle on hind tibia, and, in the male at least, by the compressed fore tibia. The seventh wing vein is evident almost to margin of wing. Otherwise similar to *Homoneura vera*.

Subgenotype.—*Phobeticomyia boettcheri* Frey.

HOMONEURA (POECILOMYZA) BOETTCHERI (Frey)

Phobeticomyia boettcheri FREY, Acta Soc. pro Fauna et Flora Fennica, vol. 56, p. 24, 1927.

Male.—Head black; frontal orbits and triangle densely gray dusted, the orbital bristles inserted in small black dots, anterior margin of frons narrowly yellow, the pale color connecting with a gray mark touching each eye, the orbits diverging from eyes anteriorly; face whitish dusted, with two black spots at middle; each orbit with two pale gray dusted marks; antennae fuscous, third segment largely yellowish; arista gray dusted. Abdomen black, shining. Legs black, tarsi testaceous, darkened apically. Wings fuscous, with a hyaline mark on each side of, and above, and below, inner cross vein, a narrow hyaline fascia extending across wing before apex of second vein and beyond outer cross vein, and three hyaline spots, or an interrupted fascia, between it and apex of wing. Halteres yellow.

All frontal bristles long, anterior orbitals shortest; arista plumose; face slightly convex. Thorax with three pairs of postsutural dorso-centrals, six series of intradorsocentral hairs, one pair of presentellar

acrostichals, and two sternopleurals. Fore femur with an antero-ventral comb; fore tibia quite sharp on dorsal surface. Last three sections of fourth vein subequal in length.

Length, 3.5 mm.

Locality.—Cuernos Mountains, Negros (C. F. Baker). Originally described from Mindanao and Masbata by Frey, who placed it in the genus *Phobeticomyia* Kertész.

Subgenus NEOHOMONEURA Malloch

This subgenus was described in the same paper as *Chaetohomoneura*. The genotype is *Sciomyza orientalis* Wiedemann.

HOMONEURA (NEOHOMONEURA) ABERRANS (de Meijere)

Lauaxania aberrans DE MEIJERE, Tijdschr. v. Ent., vol. 58, p. 90, 1915.

This is a strikingly colored species, being testaceous yellow, with a black central streak on occiput, a broad black dorsal vitta on thorax which extends almost to tip of scutellum, and a similar black dorsal vitta on abdomen. The wings are hyaline, antennae, palpi, and legs yellow.

The species differs from most of its allies in having the frons longer than wide and distinctly widened from vertex to anterior margin, and the ocellar bristles fine and minute. The arista is long plumose, the eyes are narrowed below and slightly emarginate on lower half behind; dorsocentrals three pairs, acrostichals one pair. Hypopygium very large, the superior forceps strong, tapered, extending forward to beyond middle of abdomen. Fore femur with an anteroventral comb; mid tibia with a series of short posterior setulae and one long and two shorter apical ventral bristles; hind femur with two or three preapical anteroventral bristles.

Length, 5 to 6 mm.

Locality.—Singapore (C. F. Baker). I have not seen it from the Philippines.

HOMONEURA (NEOHOMONEURA) ALBICOSTA, new species

Female.—Head yellow testaceous, frons and sides of face white dusted; ocellar spot fuscous. Thorax yellow testaceous, slightly shining, dorsum with three broad fuscous vittae overlaid with gray dust, which are fused posteriorly, the median one showing traces of a central division, and present only on the posterior half of the disc; pleura and postnotum largely fuscous; scutellum testaceous. Abdomen pitchy, paler basally, the lateral margins of tergites slightly silvery dusted. Legs testaceous. Wings white, with a large fuscous mark from apices of basal cells to well beyond outer cross vein and from middle of submarginal cell to hind margin. Halteres dull yellow.

Head as in Figure 39; frons one-third of the head width, slightly widened anteriorly, almost bare, the bristles all long, orbital stripes not shining, diverging from eyes anteriorly; face evenly convex, more pronouncedly elevated than usual in this genus; genal sutures more evident than usual, as shown in figure. Thorax with three pairs of strong postsutural dorsocentrals, one pair of prescutellar acrostichals, about ten series of intradorsocentral hairs, the anterior sternopleural lacking, and some hairs on the lower anterior portion of mesopleura bristle-like; scutellum flat above, apical bristles crossed. Abdomen stout, tergites with the apical bristles strong on sides, weaker centrally. Fore femur with an anteroventral comb; mid tibia with the posterior setulae numerous and not prominent; hind femur with one or two weak preapical anteroventral bristles. Inner cross vein at middle of discal cell; penultimate section of fourth vein fully two-thirds as long as ultimate section.

Length, 5 mm.

Type.—Cat. No. 41140, U.S.N.M. Sandakan, Borneo (C. F. Baker.)

HOMONEURA (NEOHOMONEURA) SETIVENTRIS, new species

Male and female.—Head fuscous, occipital margin and cheek testaceous, with gray dust, upper portion of face gray dusted, frons yellowish, gray dusted, orbits darker but obscured by very dense pale gray dust; antennae testaceous, gradually darkening below, the upper side of third segment basally palest; palpi fuscous. Thorax fuscous, with a broad central vitta of pale gray dust on dorsum extending lateral of the series of dorsocentral bristles, and another, narrower, vitta on each side; pleura with a gray dusted vitta across middle of mesopleura and the lower portion of sternopleura gray dusted; apex of scutellum testaceous. Abdomen testaceous, with a broad black mark at base of each tergite which is narrowly interrupted in center and leaves only the apex and lateral margins testaceous. Legs testaceous, coxae and femora black. Wings grayish hyaline, veins brown. Halteres yellow.

Frons over 1.5 as long as wide, all bristles well developed, ocellars shortest, orbits wide, the surface with a few minute hairs; antennae normal; arista plumose; cheek about half as high as width of third antennal segment. Thorax normal; scutellum flat above. Abdomen of male with many ventral bristles, the hypopygium quite densely setose. Fore femur with an anteroventral comb; mid femur with some short fine bristles on posteroventral surface in male, the hind femur in same sex with a series of quite long anteroventral bristles which is duplicated centrally; preapical dorsal bristle present on all tibiae. Inner cross vein close to middle of discal cell; penultimate section of fourth vein about four-fifths as long as ultimate section.

Length, 4 to 5 mm.

Type.—Male, Cat. No. 41076, U.S.N.M. *Type*, male, *allotype*, and 9 *paratypes*, Mount Maquiling, Luzon (C. F. Baker).

This species rather resembles *beckeri* Kertész in some particulars of color, but belongs to a different subgenus.

HOMONEURA (NEOHOMONEURA) LUGUBRIS (de Meijere)

Lauwania lugubris DE MEIJERE, Tijdschr. v. Ent., vol. 53, p. 126, 1910.

This species has the head fuscous, with the antennae hardly paler; thorax fuscous, slightly shining, the dorsum with rather dense grayish dusting and almost imperceptibly vittate, mesonotum testaceous yellow. Abdomen largely testaceous yellow, apices of the tergites black. Legs dusky, the tibiae and tarsi yellowish. Wings grayish hyaline, veins yellow, most noticeably so at bases. Halteres yellow.

Differs from the preceding species in having the posteroventral surface of mid femur with about four bristles which are much longer than the femoral diameter, the hind femur with similar long bristles on apical half of anteroventral surface, longest at base of series, and laterad of the bristles some fine hairs; preapical dorsal bristle on fore tibia longer than usual, but shorter than metatarsus; mid tibia with about four posterior bristles.

I have seen only a Javanese specimen sent to me by Doctor de Meijere.

HOMONEURA (NEOHOMONEURA) YERBURYI, new species

Female.—Head testaceous, more yellow on frons; orbital stripes and the narrow ocellar triangle, which reach to anterior margin of frons, deep black; antennae fuscous, apex of second segment and base of third yellow; proboscis and palpi yellow; a dark mark on each side of upper half of occiput. Thorax yellowish testaceous, dorsum slightly gray dusted, and with a broad vitta on each side between the dorsocentrals and supra-alar which is reddish internally, becoming black along outer margin; scutellum brownish in center, with a broad blackish mark between the brown part and the narrow testaceous margin; two large black marks on pleura, one on upper part of mesopleura, the other on upper anterior part of sternopleura; metanotum narrowly black just below scutellum. Abdomen testaceous yellow, apices of tergites narrowly black. Legs testaceous yellow. Wings yellowish hyaline, no veins clouded. Halteres yellow.

All frontal bristles long and strong; postverticals weaker and shorter than ocellars; arista plumose; eye as in *albicosta*; face evenly convex. Thorax as in *albicosta*, but the anterior sternopleural well developed. Mid tibia with the posterior setulae short, but readily

distinguishable; preapical dorsal bristle on mid and hind tibiae very short. Inner cross vein at middle of discal cell.

Length, 6.5 mm.

Type.—Hakgala, Ceylon, May 13, 1891 (Col. J. W. Yerbury).
[British Museum.]

Named in honor of the collector.

HOMONEURA (NEOHOMONEURA) JACOBSONI Malloch

Homoneura (Neohomoneura) jacobsoni MALLOCH, Suppl. Ent., vol. 15, p. 108, 1927.

This species is very similar to *honesta* Kertész, but is readily distinguished by the wing markings. (Fig. 40.) In the type specimen of this species there are short black hairs on the central portion of the propleura below and in front of spiracle which I have not seen in any specimen of *honesta*.

The type specimen of this species was sent to me as *honesta* by Doctor de Meijere, and it was recorded from Sumatra by him as that species.

HOMONEURA (NEOHOMONEURA) HONESTA (Kertész)

Lauzania honesta KERTÉSZ, Ann. Nat. Mus. Hungary, vol. 13, p. 532, 1915.

I figure the wing (Fig. 41) of this Formosan species to distinguish it from the preceding one. The species is known only from Formosa. The hypopygium is shown in Figure 49.

HOMONEURA (NEOHOMONEURA) INDICA, new species

Male.—Very similar to *honesta*, but the anterior extremity of the cloud on second vein is distinctly beyond the level of outer cross vein and in line with that of the one on third vein, the latter being well separated from the cloud on outer cross vein, and the cloud on fourth vein beginning slightly beyond the one on third, occupying more than the apical half of ultimate section of the vein. The abdomen has a faint dark spot in center at base of fourth and fifth tergite. The longest hairs on arista are longer than width of third antennal segment and the center of propleura has some microscopic black hairs.

Length, 6.5 mm.

Type.—Kyondo, Burma. Mountain District, December 13 (Micholitz). (Deutsches Entomologische Institut.)

HOMONEURA (NEOHOMONEURA) ORIENTALIS (Wiedemann)

Sciomyza orientalis WIEDEMANN, Aussereur. Zweifl. Ins., vol. 2, p. 575, 1830.

A large reddish testaceous species, with the wings marked as in Figure 43. The abdominal tergites are black on hind margins, the

black color becoming progressively more extensive apically, and covering most, or all, of disk of some of the apical tergites. Legs similar to those of *aberrans*.

Length, 6.5 to 7 mm.

Habitat.—Sumatra. I have seen only females of this species.

HOMONEURA (NEOHOMONEURA) LIMBIFERA (de Meijere)

Lauzania limbifera DE MEIJERE, Tijdschr. v. Ent., vol. 67, p. 48, 1924.

I have seen only the male of this species. Closely similar to *orientalis*, but distinguishable by the wing markings (Fig. 42), and the greater proportion of the black color of tergites of basal portion of abdomen.

Length, 7.5 mm.

Habitat.—Sumatra.

HOMONEURA (NEOHOMONEURA) PAROECA (Kertész)

Lauzania paroeca KERTESZ, Ann. Nat. Mus. Hungary, vol. 13, p. 531, 1915.

This species is readily distinguished from its allies by the markings of the wings. (Fig. 44.) The inner cross vein is not clouded, but there are dark markings over outer cross vein and a preapical elongate mark before apices of veins 2 to 4 inclusive, the one on third vein being remote from tip of vein, directly below the one just before the apex of second, and usually fused with it.

Habitat.—Formosa.

HOMONEURA (NEOHOMONEURA) NIGRONOTATA (Kertész)

Lauzania nigronotata KERTESZ, Ann. Nat. Mus. Hungary, vol. 13, p. 530.

This species differs from *paroeca* in having the spots on apical sections of the third and fourth veins almost, or quite, extending to apices of the veins, the one on third not fused with the preapical one on second vein. (Fig. 45.) There is usually a central black mark on one or more of the apical abdominal tergites.

Habitat.—Formosa.

HOMONEURA (NEOHOMONEURA) KARNYI Malloch

Homoneura (Neohomoneura) karnyi MALLOCH, Suppl. Ent., vol. 15, p. 167, 1927.

HOMONEURA (NEOHOMONEURA) INCOMPLETA Malloch

Homoneura (Neohomoneura) incompleta MALLOCH, Suppl. Ent., vol. 15, p. 198, 1927.

The above two Sumatran species were described in the same paper as was the subgenus, and they are not known to occur in the Philippines.

HOMONEURA (NEOHOMONEURA) MACGREGORI, new species

Female.—Similar to *karnyi* Malloch in color. The frons is not blackened above, though it is more fulvous than other parts of head, the frontal orbits are glossy, and the parafacials are white dusted. Abdomen with a black apical fascia on each tergite, which is dilated centrally, those becoming wider as they progress toward apex of abdomen. Wings as noted in the key, the costal cloud beginning distinctly, but not widely, beyond apex of first vein, and the apical cloud entire, almost connected with the one over outer cross vein.

The presence of microscopic black hairs on center of propleura readily distinguishes the species from *karnyi*.

Length, 7 mm.

Type.—Cat. No. 40880, U.S.N.M.. Puerto Princesa, Palawan Island, September, 1925 (R. C. McGregor).

Named in honor of the collector. Type in United States National Museum.

Subgenus EUHOMONEURA Malloch

I erected this subgenus in a paper published in Australia, with the genotype *Lauxania ornatipennis* de Meijere.

HOMONEURA (EUHOMONEURA) NIGRIFLUA, new species

Female.—Head testaceous, densely pale gray dusted, interfrontalia brownish, yellow in front, differentiated from the orbits and triangle when seen from behind, the orbits broad, not diverging from eyes anteriorly; a blackish spot between each antenna and eye, and a transverse fuscous mark on middle of face; antennae black, whitish at base of third segment surrounding insertion of arista; palpi black. Thorax testaceous, densely gray dusted, and largely marked with fuscous, the mesonotum mostly fuscous, with three spots on anterior margin, three larger marks just behind suture, and the hind margin, dark brown; scutellum dark brown or fuscous at base. Abdomen shining brownish black. Legs pitchy colored, tibiae a little paler, tarsi testaceous. Wings marked with fuscous as in Figure 46. Halteres pale yellow.

All frontal bristles strong, anterior orbitals little more than half as long as posterior pair; arista plumose. Thorax with 1+2 dorso-centrals and six series of intradorsocentral hairs. Fore femur with an anteroventral comb.

Length, 3.25 mm.

Type.—Cat. No. 41137, U.S.N.M. *Type* and one *paratype*, Mount Maquiling, Luzon (C. F. Baker).

HOMONEURA (EUHOMONEURA) LUNATA (de Meijere)

Lauzania lunata DE MEIJERE, Tijdschr. v. Ent., vol. 53, p. 135, 1910.

I have figured the wing of a Javanese example of this species sent to me by Doctor de Meijere (Fig. 47). I have before me a specimen from Baguio, Benquet Province, which has the lunate spot in the anal cell separated from the large basal dark area, and the latter is not carried forward along the posterior margin of cubitus (fifth vein), its outer margin running straight to the vein. I believe this specimen belongs here, but would like to see more material in order to determine the degree of variation in the markings of the species.

Another Philippine specimen from Billiran Island (C. F. Baker).

I can detect no differences between this species and *irrorata* de Meijere and consider the latter is a synonym of *lunata*.

HOMONEURA (EUHOMONEURA) ORNATIPENNIS (de Meijere)

Lauzania ornatipennis DE MEIJERE, Tijdschr. v. Ent., vol. 53, p. 141, 1910.

This species differs from *lunata* in having the cloud on outer cross vein extending broadly to margin of wing and to apex of fifth vein, and no small dark dot between that cloud and the preapical fascia.

One specimen, Mount Maquiling, Luzon (C. F. Baker).

I have seen this species from Java and Australia (*atrogrisea* Malloch).

HOMONEURA (EUHOMONEURA) LUNIPENNIS (de Meijere)

Lauzania lunipennis DE MEIJERE, Tijdschr. v. Ent., vol. 67, p. 50, 1924.

This species has a dark vitta extending from anterior margin of mesonotum just mesad of the humeral callus to beyond base of wing, which is only present in part in *ornatipennis*. The wings in both species are very similar, but in the type specimen of *lunipennis* the anal field has the lunate spot much larger and connected on hind margin with the basal cloud, so that there is a small hyaline inclosed area in the center of the dark portion.

Habitat.—Sumatra.

MINETTIODES, new subgenus

This subgenus is similar to *Homoneura vera*, but differs in having the thorax with a pair of short, but distinct, intra-alar bristles.

Subgenotype.—*Lauzania parvinotata* de Meijere.

HOMONEURA (MINETTIODES) PARVINOTATA (de Meijere)

Lauzania parvinota DE MEIJERE, Tijdschr. v. Ent., vol. 57, p. 231, 1914.

A testaceous yellow species, with a pair of round black spots on fifth tergite, and sometimes a much smaller pair on sixth. The ocellar bristles are rather small and weak, both pairs of orbitals are

long, the hairs on arista are not much longer than its basal diameter, the thorax has three pairs of postsutural dorsocentrals, and two distinct sternopleurals. The hypopygium is shown in Figure 50.

Originally described from Sumatra. I have before me a male from Kolambugan, Mindanao (C. F. Baker).

HOMONEURA (MINETTIoidES) CRASSIUSCULA (de Meijere)

Laurania crassiuscula DE MEIJERE, Tijdschr. v. Ent., vol. 53, p. 128, 1910.

This species is more robust than the preceding one and has the frons fully twice as long as wide at anterior margin instead of about 1.5 as long as wide, and the sternopleura is largely fuscous instead of entirely yellow.

I have seen only a female of this species, from Sumatra.

HOMONEURA (MINETTIoidES) FUMIPENNIS (Malloch)

This species was described in "Entomologische mitteilungen" (May, 1927, p. 169). It is readily distinguished as indicated in the synopsis, and is known only from Formosa.

I have seen two Samoan species referable here.

Subgenus HOMONEURA Van Der Wulp

There are several segregates which I still retain in *Homoneura* that ought to be considered as entitled to subgeneric separation, but I leave further subdivision to the future, believing that there must be many species yet unknown in this region, and possibly some of the groups now appearing quite well distinguished may be connected by means of yet unknown forms so closely that lines of demarcation will disappear.

Genotype.—*Homoneura picea* van der Wulp.

HOMONEURA (HOMONEURA) PILISETA, new name (=PUBISETA de Meijere)

Very similar structurally to *nudiseta* (Kertész), but, in addition to the characters mentioned in the key, the frontal orbits are densely pale gray dusted and at the upper bristle not over half as wide as interfrontalia at same point. Legs mostly black.

Habitat.—Sumatra.

The specific name *pubiseta* was used by Kertész for another species in 1900.

HOMONEURA (HOMONEURA) EXIGUA (de Meijere)

Laurania exigua DE MEIJERE, Tijdschr. v. Ent., vol. 51, p. 141, 1908.

This small species has the frontal orbits not over one-fourth of the width of the interfrontalia, and the anterior pair of thoracic dorsocentrals much more reduced in size than in the other three species of this group.

Habitat.—Java.

HOMONEURA (HOMONEURA) COFFEATA (de Meijere)

Lauzania coffeata DE MEIJERE, Tijdschr. v. Ent., vol. 57, p. 228, 1914.

I have taken the characters of this species from the type specimen, which was submitted to me by Doctor de Meijere with examples of the other three species.

HOMONEURA (HOMONEURA) NUDISETA (Kertész)

Lauzania nudiseta KERTÉSZ, Termeszetrájsi Füzetek, vol. 23, p. 263, 1900.

The Javanese specimen before me agrees perfectly with Kertész's description.

Originally described from Singapore.

HOMONEURA (HOMONEURA) HAWAIIENSIS Malloch

The description of this species appeared in the Proceedings of the Hawaiian Entomological Society (vol. 6, No. 3, October, 1927, p. 383). The hypopygium is shown in Figure 51.

HOMONEURA (HOMONEURA) CRASSICAUDA Malloch

Homoneura (Homoneura) crassicauda MALLOCH, Ent. Mitt., vol. 16, p. 171, 1927.

HOMONEURA (HOMONEURA) NUDIFRONS (Kertész)

Lauzania nudifrons KERTÉSZ, Ann. Nat. Mus. Hungary, vol. 11, p. 99, 1913.

The first of these two species was described in the paper referred to above, and it was therein compared with *nudifrons*. The hypopygium of *nudifrons* is shown in Figure 53, and of *crassicauda* in Figure 54.

Habitat.—Of both species, Formosa. I have seen females from Ceylon which I refer to *crassicauda* tentatively.

HOMONEURA (HOMONEURA) CURTA, new species

Male and Female.—Entirely testaceous yellow, frons opaque except on the narrow ill-defined orbits, thorax and abdomen slightly shining. Wings yellowish hyaline. Frons about 1.5 as long as wide, both pairs of orbitals strong, surface hairs very sparse, ocellars fine and almost hair-like, not as long as postverticals, the latter shorter than anterior orbitals, inner pair of verticals longer than outer pair; antennae normal; arista distinctly pubescent; cheek not as high as width of third antennal segment. Thorax with the usual 3 pairs of postsutural dorsocentrals, the intradorsocentral hairs in 6–9 irregular series, and at least one pair of well developed postsutural acrostichals besides the prescutellar pair; scutellum slightly flattened above; anterior sternopleural rather weak. Abdomen of male stout, rather short,

quite abruptly truncate at apex, and almost cylindrical, hypopygium as Figure 52. Fore femur with an antroventral comb; all tibiae with preapical dorsal bristle. Inner cross vein close to middle of discal cell, apical section of fourth vein about twice as long as preapical.

Length, 3 mm.

Type, allotype and 46 *paratypes*, Ceylon (D. W. Horn).

Type, allotype, and *paratypes* in Deutsches Entomologisches Institut, *paratype* in U. S. National Museum, Cat. No. 41700, U.S.N.M.

HOMONEURA (HOMONEURA) DIACROSTICHALIS, new name

This is a new name for *Lauzania monticola* de Meijere, which is pre-empted by *Homoneura monticola* Melander, a North American species, described as a *Minettia*.

HOMONEURA (HOMONEURA) PHILIPPINENSIS, new species

A small yellow species with a pair of black spots on fifth abdominal tergite, and hyaline wings. The presence of one or two pairs of distinct postsutural acrostichals besides the prescutellar pair, and the structure of the hypopygium (fig. 56) should readily distinguish it from all its allies.

Length 2.5 mm.

Type.—Philippines.

HOMONEURA (HOMONEURA) PUBISETA (Kertész)

Lauzania pubiseta KERTÉSZ, Termeszetráizi Füzetek, vol. 23, p. 262, 1900.

This species has usually three dark spots on fifth tergite and two or three on sixth in both sexes. The general characters are similar to those of *philippinensis* but the apical processes of seventh tergite are remarkably long and slender (Fig. 57), and when at rest they cross each other on center and project even beyond the sides of abdomen.

Length, 3 mm.

Originally described from New Guinea. I have it from Palmerston, N. Australia (D. E. I.).

HOMONEURA (HOMONEURA) PADANGENSIS (de Meijere)

Lauzania padangensis DE MEIJERE, Tijdschr. v. Ent., vol. 58, p. 91 1915.

This species is shining testaceous in color, with a black spot on some of the tergites of apical half of abdomen, usually from third to sixth in female and third to fifth in male. The wings are yellowish, with four pale-brown clouds much as in *jacobsoni*, one over outer cross vein, the others on apical sections of veins 2 to 4, inclusive, those on the third and fourth veins not, or hardly, extending to apices of veins.

The most striking character of this and the next three species lies in the elongate thickening of fifth vein at base of its penultimate section, which thickened part is furnished with microscopic hairs below. Other outstanding features of all four are the strong postocular ciliae, the strong lower occipital bristles, and strong bristly setulae below the level of humeral bristle. These are the only four species known to me which possess the above-mentioned characters of venation.

Male hypopygium as Figure 58.

Locality.—Both sexes, Mount Maquiling, Luzon, and one male, Dapitan, Mindanao (C. F. Baker). I have examined the type specimen from Sumatra.

HOMONEURA (HOMONEURA) INTERMEDIA, new species

Male.—Differs from *padangensis* only in having the apices of veins 3 and 4 almost without brown clouding, and in the structure of the hypopygium (Fig. 59).

Type.—Cat. No. 41152, U.S.N.M. Dapitan, Mindanao; four *paratypes*, Mount Maquiling, Luzon (C. F. Baker).

HOMONEURA (HOMONEURA) COSTALIS, new species

Female.—Shining testaceous yellow. Oceller spot not darkened. Abdomen with a large black spot in center of tergites 5 to 7, inclusive. Wing with a broad dark-brown cloud on costa, rather faint proximad of apex of first vein, from there to almost over outer cross vein, extending almost to third vein, and from the latter point extending over entire first posterior cell and faintly into apex of second, except for a small oblong area on third vein beyond outer cross vein, and connecting with a dark spot over upper extremity of outer cross vein.

Frons a little longer than wide; orbits shining, the two pairs of orbital bristles long and strong; ocellars shorter and weaker than the postverticals; inner verticals very long; arista plumose. Thorax normal. Fore femur with an anteroventral comb; mid femur with some fine posteroventral bristles; hind femur with a series of similar hair-like anteroventral bristles. Fifth wing vein with an elongate swelling at base which is microscopically haired below; inner cross vein at about two-fifths from base of discal cell; ultimate section of fourth vein not much longer than penultimate section.

Length, 5 mm.

Type.—Cat. No. 41133, U.S.N.M. *Type* and one *paratype*, Mount Maquiling, Luzon (C. F. Baker).

This species is readily distinguished from the other three known to me in which the fifth vein is swollen at base by the very much

more extensively clouded wings. Only the female is represented in the material before me, so that it is not possible to indicate hypopygial distinctions.

HOMONEURA (HOMONEURA) HORNII, new species

Male.—Differs from the preceding species in having the longitudinal veins without any evidence of apical clouds, and in the structure of the hypopygium. (Fig. 60.)

Type, male, Philippine Islands (Osten-Sacken collection; *allotype* and one *paratype*, Mount Maquilang, Luzon (C. F. Baker).

The type specimen was submitted to me by Dr. Walther Horn of the Deutsches Entomologisches Institut, and is named in his honor.

Paratype.—Cat. No. 40394, U.S.N.M.

HOMONEURA (HOMONEURA) CRINITA, new species

Male.—Shining black. Frons yellowish in front; face, cheeks, and lower postocular orbits, densely silvery white dusted; antennae missing in type. Thoracic dorsum slightly white dusted, the region surrounding prothoracic spiracle quite conspicuously white dusted. Legs black, tarsi stramineous. Wings yellowish hyaline, rather faintly infuscated at bases. Knobs of halteres black.

Frons a little wider than long; orbitals long. Thorax as in *opacithorax*, the intradorsocentral setulae in eight series. Fore femur with an anteroventral comb; fore tibia with a hair-like preapical dorsal bristle which is about as long as basal segment of fore tarsus; mid tibia with fine curled hairs on apical half of posteroventral surface, the longest of which are a little longer than the tibial diameter; bristling of hind legs not exceptional. Superior and inferior hypopygial forceps about equal in size, a little thicker, and about as long as, preapical dorsal bristle on mid tibia. Inner cross vein a little before middle of discal cell; apical section of fourth vein about 1.5 as long as preceding section.

Length, 4 mm.

Type.—Cat. No. 41154, U.S.N.M. Tanglecolan, Bukidnon (C. F. Baker).

HOMONEURA (HOMONEURA) HIRTITIBIA, new species

Male.—Similar in coloration to *crinita*, but more brownish, especially on face, the fore tarsi darker. Antennae testaceous yellow.

Differs from *crinita* in having the posterior side of mid tibia with dense setulose decumbent hairs which are much longer than the tibial diameter, and the ventral surface with short fine hairs; the hind femur has a series of fine bristles on apical half of anteroventral surface which become longer to apical one, which is much longer

than the femoral diameter; mid femur with a single very long bristle near base on anteroventral surface.

Length, 4.5 mm.

Type.—Cat. No. 41153, U.S.N.M. Butuan, Mindanao (C. F. Baker).

This strikingly distinct species is represented by the type specimen only, which is in poor condition, having been crushed in mounting.

HOMONEURA (HOMONEURA) DENTIFERA, new species

This and the next four species are very similar in appearance, all being shining black, with some whitish dusting on head and thorax, black halteres, fuscous bases to wings, and black legs, with yellow tarsi. The frons is yellowish on front margin, the face, and eye margins, are white dusted, and there are white-dusted areas along inner margins of humeral callosities, and over the propleural spiracle.

In all the species the frontal bristles are strong, the arista is plumose, the thorax has three pairs of postsutural dorsocentrals, one pair of prescutellar acrostichals, 8–10 series of intradorsocentral hairs, and two sternopleurals. The fore femur has an anteroventral comb, and all tibiae have a preapical dorsal bristle. The differentiating characters are found in the structure of the male hypopygium. In *dentifer* there is a stout process which has three or four sharp teeth projecting at different angles. (Fig. 62.)

Length, 4 mm.

Type.—Cat. No. 41156, U.S.N.M. *Type*, Singapore (C. F. Baker). *Paratype*, Java (Jacobson).

The paratype was sent to me as *picea* van der Wulp by Doctor de Meijere prior to my receipt of the other specimens, similarly named, now referred to *trispina*. It appears to me to be impossible to identify which, if any one, of the species before me is that described by van der Wulp.

HOMONEURA (HOMONEURA) TRISPINA Malloch

Homoneura (Homoneura) trispina MALLOCH, Suppl. Ent., vol. 15, p. 109, 1927.

There is practically no character so far as I can see for distinguishing this species from *dentifera* except the structure of the male hypopygium. (Fig. 65.)

Localities.—Singapore (C. F. Baker); Sumatra; Buitenzorg, Java (Jacobson).

Type.—Cat. No. 41157, U.S.N.M.

HOMONEURA (HOMONEURA) MAQUILINGENSIS, new species

Here again we have to depend upon the structure of the male hypopygium for distinguishing the species. (Fig. 64.) See characters in key.

Length, 4 mm.

Type.—Cat. No. 41139, U.S.N.M. *Type* and six *paratypes*, Mount Maquiling, Luzon; one *paratype*, Los Banos (C. F. Baker).

There are some females in my possession which I have placed with the last two species, but whether correctly or not I have no means of determining. If the type of *picea* is a female it may not be possible to identify it specifically. The females are distinguished by the structure of the apical abdominal sternites. (Figs. 97 and 98.)

HOMONEURA (HOMONEURA) FOLIFERA Malloch

Homoneura (Homoneura) folifera MALLOCH, Suppl. Ent., vol. 15, p. 110, 1927.

HOMONEURA (HOMONEURA) OPPOSITA Malloch

Homoneura (Homoneura) opposita MALLOCH, Suppl. Ent., vol. 15, p. 110, 1927.

The above two recently described species are referable to the same group and the hypopygia are figured herein. (Figs. 66 and 63.)

They are from Sumatra, and may yet be found in the Philippines.

HOMONEURA (HOMONEURA) OPACITHORAX, new species

Female.—Head entirely black, whitish dusted, most noticeably so on frontal orbits, face, cheeks, and postocular orbits; antennae, palpi, and aristae, black. Thorax dull black, the dorsum evenly brownish dusted. Abdomen shining black, but slightly dusted. Legs fuscous, tibiae dusky testaceous, tarsi paler testaceous. Wings grayish hyaline, not darkened at bases. Halteres yellow, knobs dark.

Frons a little longer than wide, the bristles long and strong, anterior orbitals over half as long as posterior pair, ocellars parallel, as long as postverticals; arista with very long hairs above, much shorter haired below; third antennal segment quite large, about twice as long as broad; face evenly and slightly convex. Thorax with three pairs of long postsutural dorsocentrals, the prescutellar acrostichals distinct, and six series of intradorsocentrals; anterior sternopleural short. Abdomen rather sparsely haired. Fore femur with anteroventral comb; mid tibia without median posterior bristles; hind femur without ventral bristles. Inner cross vein at middle of discal cell and a little beyond apex of first vein; penultimate section of fourth vein less than half as long as ultimate section; wing narrower than usual.

Length, 2.25 mm.

Type.—Cat. No. 41158, U.S.N.M. Mount Maquiling, Luzon (C. F. Baker.)

HOMONEURA (HOMONEURA) PICEOIDES, new species

Male.—Very similar to the species of the *dentifera* group in habitus and coloration. There is no discernible white dusting round the propleural spiracle nor on anterior part of thoracic dorsum, and the base of the wing and apex of auxiliary vein are not infuscated.

The chaetotaxy is similar to that of the *dentifera* group, but the male hypopygium is quite different. (Fig. 67.)

Length, 4 mm.

Type.—Cat. No. 41155, U.S.N.M. *Type* and *paratype*, Mount Maquiling, Luzon (C. F. Baker).

I have placed here also three females from the same locality.

HOMONEURA (HOMONEURA) NIGRITA, new species

Male.—Agrees with *piceoides* in all characters except the structure of the male hypopygium. (Fig. 68.)

Length, 3.5 mm.

Type.—Cat. No. 41159, U.S.N.M. *Type* and *paratype*, Singapore (C. F. Baker).

HOMONEURA (HOMONEURA) LUZONENSIS, new species

Male.—Testaceous yellow, slightly shining. Ocellar region not darkened; antennae and palpi yellow. Thorax unicolorous yellow. Abdomen with a pair of round black spots on fourth visible tergite. Wings yellowish hyaline. Legs yellow. Halteres yellow.

Frons about 1.5 as long as wide at vertex; ocellars short and fine, extending to about middle of frons, not as strong as postverticals; orbitals long, anterior pair the shorter; inner vertical bristles much longer than outer pair; arista with long hairs; hairs on margin of cheek fine and short. Thorax with three postsutural pairs of strong dorsocentrals and one presutural and three postsutural pairs of strong acrostichals, the presutural pair rather widely separated; anterior sternopleural bristle short. Abdomen broad, apical tergal bristles rather long. Legs normal, the fore femur with anteroventral comb. Wings rather narrow; inner cross vein very slightly before middle of discal cell; ultimate section of fourth vein about 1.5 as long as penultimate section.

Length, 5 mm.

Type.—Cat. No. 41134, U.S.N.M. Mount Maquiling, Luzon (C. F. Baker).

The strong acrostichal bristles distinguish this species from any of those in which the abdomen is bipunctate with black.

HOMONEURA (HOMONEURA) ROBUSTA, new species

Male.—Head largely pitchy colored, center and anterior margin of frons, sides, and lower margin of face, and the entire antennae, testaceous yellow. Thorax testaceous yellow, rather distinctly shining, with slight grayish dusting, mesonotum with a broad fuscous central vitta on entire length; pleura largely fuscous; scutellum testaceous yellow, metanotum fuscous centrally. Abdomen shining black. Legs

dusky testaceous, coxae and femora almost entirely fuscous. Wings conspicuously yellowish hyaline, veins brownish yellow, paler at bases. Knobs of halteres yellow.

Frons about as long as width at vertex, slightly narrowed anteriorly, bare except for the bristles, the latter all strong, anterior orbitals a little shorter than the ocellars; arista plumose, about as long haired below as above; face slightly and evenly convex. Thorax with three pairs of strong postsutural dorsocentrals, the anterior pair just behind suture, and four or five pairs of shorter strong acrostichals, the anterior pair at, or close to, suture; anterior sternopleural distinct. Abdomen robust, tergites with distinct apical bristles; hypopygium not large. Fore femur with fine preapical anteroventral comb; mid tibia with one long and two shorter apical ventral bristles; no outstanding ventral bristles on mid and hind femora. Inner cross vein a little before middle of discal cell; apical sections of veins 3 and 4 parallel; that of the latter about 1.5 as long as its penultimate section.

Type.—Cat. No. 41151, U.S.N.M. Mount Maquiling, Luzon (C. F. Baker).

A robust species resembling those of the *trispina* group.

HOMONEURA (HOMONEURA) BILINEELLA (Frey)

Mallochomyza bilineella FREY, Acta, Soc. pro Fauna et Flora Fennica, vol. 56, No. 8, p. 38, 1927.

Male.—Shining testaceous yellow. Frons broadly dark brown in center; facial orbits densely white dusted; third antennal segment black except at base; palpi black at apices. Thoracic dorsum with two narrow fuscous vittae between the series of dorso-centrals which extend to hind margin of mesonotum and connect with a large black spot on base of scutellum; notopleural suture dark. Abdomen and legs unicolorous yellow. Wings grayish hyaline, outer cross vein faintly clouded.

Anterior orbitals about one-third as long as posterior pair, and a little shorter than ocellars; inner verticals over twice as long as outer pair; arista long plumose. Thorax with three pairs of postsutural dorsocentrals, the anterior pair at suture, one pair of prescutellar acrostichals, about eight series of intradorsocentral hairs, and the anterior sternopleural short. Hypopygium as Figure 69. Fore femur with an anteroventral comb; hind tibia without a preapical dorsal bristle, the apical part of dorsum sharply ridged. Inner cross vein at middle of discal cell; penultimate section of fourth vein fully two-thirds as long as ultimate section.

Length, 3.5 mm.

Locality.—Mount Maquiling, Luzon (C. F. Baker).

This species was ranked as a variety of *nothosticta* Frey by Doctor Frey in his paper on the Philippine Sapromyzidae, and his type specimen was from Los Banos.

HOMONEURA (HOMONEURA) DEMEIJERII, new species

Male.—This species was submitted to me as *notostigma* Kertész by Doctor de Meijere, and in every character except the male hypopygium it is similar to that species. In order to make absolutely certain that the identification was correct I dissected the hypopygia of the species and find that they appear to be distinct species. The principal characters for distinguishing them lie in the shape of the superior and inferior forceps as shown in Figures 71 and 72 of *notostigma* and 73 and 74 of *demeijerii*.

Length, 3 mm.

Type.—Fort de Kock, Sumatra, 11, 1913 (E. Jacobson).

Type specimen returned to Doctor de Meijere.

HOMONEURA (HOMONEURA) NOTHOSTICTA (Frey)

Mallochomyza nothosticta FREY, Acta Soc. pro Fauna et Flora Fennica, vol. 59, p. 37, 1927.

Male and female.—Glossy testaceous yellow. Third antennal segment except base, and apices of the palpi, black; center of frons broadly fuscous. Thorax with a broad black mark on posterior margin of disk filling the area between the dorsocentrals and connecting with a similar mark on base of scutellum; notopleural suture fuscous. Outer cross vein clouded.

Structurally similar to *bilineella*, but the anterior orbital is not one-third as long as the posterior one, and the hypopygium is as Figure 70.

Length, 4–4.5 mm.

Locality.—Mount Maquiling, Luzon (C. F. Baker).

Doctor Frey's specimen was from Surigao, Mindanao.

HOMONEURA (HOMONEURA) BAKERI, new species

Male.—Shining testaceous yellow, aristae, a triangular mark on each side of frons between orbital stripe and eye, apical half or more of third antennal segment, and apices of palpi deep black; sides of face densely white dusted, most conspicuous when seen from above; outer cross vein of wings faintly clouded.

Frons a little wider than long, the bristles long and strong, the anterior orbitals shorter than the posterior; arista long plumose; third antennal segment slightly tapered to apex, over twice as long as wide; face very slightly convex. Thorax with three pairs of

strong postsutural dorsocentrals, one pair of prescutellar acrostichals, and ten series of rather irregular intradorsocentral hairs; anterior sternopleural short but distinct. Bristles on apices of abdominal tergites rather long; hypopygium small, as Figure 75. Fore femur with anteroventral comb; preapical dorsal bristle on fore tibia slender, about three-fourths as long as basal segment of fore tarsus; mid tibia with one long and two unequal short apical ventral bristles; hind femur with a preapical anteroventral bristle; hind tibia without a preapical dorsal bristle, the surface in type with a ridge dorsally for a short distance at apex. Inner cross vein at middle of discal cell; ultimate section of fourth vein about 1.5 as long as penultimate section.

Length, 4.5 mm.

Type.—Cat. No. 41136, U.S.N.M. *Type*, male, allotype, and seven *paratypes*, Mount Maquiling, Luzon (C. F. Baker).

HOMONEURA (HOMONEURA) ATRICEPS, new species

Male.—Shining testaceous yellow. Frons with a large subquadrate dark central mark; face deep black, the parafacials velvety and, when seen from above, with very slight white dusting, central portion of face shining; apical half of third antennal segment deep black; palpi yellow. Thorax with two narrow black vittae mesad of the dorsocentral bristles which begin behind anterior margin and connect with a dark mark on base of scutellum, and the notopleural suture infuscated. Abdomen without black markings. Legs yellow. Outer cross vein of wing slightly dark clouded.

Anterior orbital bristles about one-third as long as posterior pair and not as long as ocellars; outer verticals about half as long as inner pair; arista long plumose. Thorax with the usual bristles, the intradorsocentral hairs in 8–10 series; scutellum flat above. Fore femur with an anteroventral comb; mid femur with some long fine posteroventral bristles; hind femur with some similar anteroventral bristles; hind tibial carina very slight. In other respects except the hypopygium similar to *nothosticta* Kertész.

Length, 3.5–4 mm.

Type.—Cat. No. 41135, U.S.N.M. *Type* and five *paratypes*, Mount Maquiling, Luzon (C. F. Baker).

The markings of the dorsum of thorax are the same as in *bilineella* Frey, but in the latter the face is yellow, as it is in all the other species belonging to the group in which the hind tibial bristle is lacking so far as I know now.

It might be proper to erect a subgenus for this group, but it is not imperative at this time, so I leave it unnamed meantime.

HOMONEURA (HOMONEURA) CIRCUMCINCTA (Frey)

Mallochomyza circumcincta FREY, Acta Soc. pro Fauna et Flora Fennica, vol. 56, No. 8, p. 39.

Female.—Head yellowish testaceous, frons more ochreous, the orbital stripes and ocellar spot gray; basal two antennal segments and base of third up to insertion of arista, deep black, third segment darkened at apex; aristae and their hairs black; palpi yellow. Thorax fuscous, densely gray dusted, humeral angles, most of pleura, notopleural suture, a narrow apical margin of scutellum and ventral surface of same, testaceous yellow. Abdomen fuscous, densely gray dusted, apices of tergites very narrowly yellowish, their lateral margins more broadly so. Legs testaceous yellow, or stramineous, with a faint dark mark on anterior surface of fore femur at the preapical comb. Wings hyaline. Halteres pale.

Anterior orbital strong, farther from eye than posterior; ocellars as long as postverticals; arista plumose; third antennal segment about 1.5 as long as wide; face slightly convex. Thorax normal, with three pairs of postsutural dorsocentrals; scutellum flat above. Fore femur with anteroventral comb; fore tibia with short preapical dorsal bristle; mid tibia with one long and two, unequal, shorter, apical ventral bristles. Inner cross vein close to middle of discal cell; penultimate section of fourth vein about half as long as ultimate section.

Length, 4 mm.

Originally described from Surigao and Mumungan, Mindanao. I have three specimens from Tangcolan, Bukidnon (C. F. Baker).

HOMONEURA (HOMONEURA) TRIFASCIATA (de Meijere)

Lauwania trifasciata DE MEIJERE, Tijdschr. v. Ent., vol. 53, p. 130, 1910.

A rather robust species, readily distinguished by the very short-haired arista, markings of abdomen, short and weak ocellar bristles, and unclouded cross veins. The hairs on sides of face are short and weak, and the last section of fourth vein is twice as long as preceding section.

Length, 3.75 mm.

I have seen this species only from Java.

HOMONEURA (HOMONEURA) NEOSIGNATA, new species

Male.—Testaceous yellow. Frons dull except the orbits and triangle, ocellar region not darkened, face glossy, parafacials dull, white dusted, antennæ and palpi yellow. Thorax unicolorous yellow, glossy. Abdomen not so glossy as mesonotum, with a large round black spot on each side of fourth visible tergite. Legs yellow. Wings yellowish hyaline, outer cross vein with a very slight indication of a yellowish cloud. Halteres yellow.

Frons a little broader than long, all bristles well developed, the ocellars slightly longer than anterior orbitals, postverticals well below vertex; arista plumose; face slightly and evenly convex; hairs on margin of cheek short and regular. Thorax normal, intradorsocentral hairs in about 12 series; anterior sternopleural short. Abdomen rather broad, tapered to apex, the apical tergal bristles well developed; apical arm of eighth tergite black, broad, terminating in a short sharp tip which is curved forward, and with a similar short thorn on its hind margin near base. Legs normal, fore femur with an anteroventral comb; mid femur with a series of short hairs on basal half of anteroventral surface. Inner cross vein a little proximad of middle of discal cell; apical section of fourth vein very slightly longer than subapical section.

Length, 5 mm.

Type.—Cat. No. 41138, U.S.N.M. Mount Maquilang, Luzon (C. F. Baker).

This species was received after the manuscript of the paper was completed and circumstances prevent me from figuring the hypopygium.

HOMONEURA (HOMONEURA) BIOCULATA (de Meijere)

Lauxania biocultata DE MEIJERE, Tijdschr. v. Ent., vol. 57, p. 225, 1914.

I have before me a Javanese specimen of this species sent to me by Doctor de Meijere. The general color is paler than that of the next species, there is but one pair of abdominal spots visible, the longest hairs on arista are not longer than width of the third antennal segment, and the length of the insect is less than that of *signata*.

It is very similar to *kerteszi* (de Meijere) (= *orientalis* Kertész), but I have only a damaged specimen of the latter which lacks the antennae so can not give a reliable diagnosis, and merely quote de Meijere's differentiating character.

I consider it highly probable that *ochripennis* (Frey) is this species.

HOMONEURA (HOMONEURA) IMMACULIPENNIS, new species

Male.—Entirely testaceous yellow, shining. Ocellar spot hardly darkened. Abdomen with three black spots on fourth tergite, and five on fifth. Wings yellowish hyaline.

Frons a little wider at vertex than long at centre, narrower at anterior margin, inner vertical bristles about twice as long as outer pair, the latter as long as posterior pair, and a little closer together than these; arista long plumose. Thorax with three pairs of long postsutural dorsocentrals, the anterior pair close to suture, one pair of prescutellar acrostichals, eight series of intradorsocentral hairs, and the anterior sternopleural shorter than posterior one. Hypopygium as Figure 81. Fore femur with anteroventral comb; all

tibiae with a preapical dorsal bristle; mid tibia with one long and two short apical ventral bristles. Inner cross vein a little before middle of discal cell; penultimate section of fourth vein fully three-fourths as long as ultimate.

Length, 4 mm.

Type.—Cat. No. 41698, U.S.N.M.; Mount Maquiling, Luzon (C. F. Baker).

HOMONEURA (HOMONEURA) SIGNATA (van der Wulp)

Minettia signata VAN DER WULP, Tijdschr. v. Ent., vol. 22, p. 52, 1881.

I believe *javanensis* (de Meijere) is a synonym of this species. I have figured the male hypopygium. (Fig. 82.)

Localities.—Singapore; Surigao, Mindanao (C. F. Baker).

The specimen of *javanensis* submitted by Doctor de Meijere is a female agreeing perfectly with one from Singapore, but in the absence of a male definite allocation as a synonym is inadvisable.

I consider *dapaensis* (Frey) is probably this species.

HOMONEURA (HOMONEURA) MEDIOSIGNATA (Frey)

Mallochomyza mediosignata FREY, Acta Soc. pro Fauna et Flora Fennica, vol. 56, p. 34, 1927.

Male.—This species has much the same appearance as *immaculipennis*, but the outer cross vein of wing is narrowly and faintly clouded, the central and submedian dark spots on fifth tergite, and the central one on sixth, are large and quadrate, the lateral spots are smaller, and the submedian pair on sixth are almost lacking in type.

Structurally the two species are very similar, but the upper hair of each series on lower part of sides of face is much longer than the others which is not the case in the other species. The downwardly projecting process of the eighth abdominal tergite is shorter than in *immaculipennis*, and is more rounded at apex. In other respects the species are very similar.

Length, 4 mm.

Originally described from Montalban and La Trinidad, Luzon. I have it from only Mount Maquiling, Luzon (C. F. Baker).

HOMONEURA (HOMONEURA) FUSCOBRUNNEA, new species

Male and female.—Head and thorax varying from brownish testaceous to brownish fuscous in color, the thorax with grayish dusting; abdomen varying much as thorax, but always paler at base. Legs brownish testaceous, femora sometimes darkened, tarsi always pale. Wings hyaline, outer cross vein not clouded. Halteres yellowish brown.

Structurally similar *dichroa* (de Meijere), the hypopygium of which is shown in Figure 95, but quite different in color. Closest to *grossa* (de Meijere), differing in having the outer cross vein un-

clouded, and abdomen infuscated apically. The thoracic chaetotaxy is the same as in those species, as are also most of the other characters. All frontal bristles long; arista plumose. Fore femoral comb present; mid tibia without posterior bristles and with three long apical ventral bristles.

Length, 4.5–5 mm.

I have not seen an undoubted male of *grossa*, so am unable to compare the hypopygium with that of *fuscobrunnea* (Fig. 84).

Type, *allotype*, and one female *paratype*, Mount Maquiling, Luzon; female *paratypes*, Kolambugan, and Butuan, Mindanao (C. F. Baker); male *paratype*, Philippine Islands (Osten Sacken collection).

Type.—Cat. No. 41160, U.S.N.M.

HOMONEURA (HOMONEURA) LATICOSTA (Thomson)

Geomyza laticosta THOMPSON, Kongl. Svenska Freg. Eugen. Resa, Insecta, p. 598, 1869. .

This species usually has the wings broadly pale smoky brown on costa, the suffusion extending to, or beyond, third vein, and a similar suffusion over the outer cross vein. Sometimes this costal clouding is almost, or quite, absent, and that over the outer cross vein faint. In doubtful cases the structure of the male hypopygium may be depended upon to distinguish the species (Fig. 89).

Length, 3 mm.

I have seen a Javanese specimen, and a series from Kolambugan, Mindanao (C. F. Baker). Doctor Frey records it from many localities in the Philippines and from Ceram, Buru, Malacca, and Java.

HOMONEURA (HOMONEURA) GEOMYZINA (Frey)

Mallochomyza geomyzina FREY, Acta Soc. pro Fauna et Flora Fennica, vol. 56, No. 8, p. 33, 1927.

Male.—Shining testaceous yellow, abdomen with a round black spot on each side of sixth tergite, and apparently with a larger spot on each side of fifth tergite also. Wings hyaline, with a faint dark cloud along costa from base to about middle of third section, and four conspicuous fuscous clouds (Fig. 48). Legs yellow, fore tarsi brownish. Halteres yellow.

Frons wider than long, inner vertical bristle very long, orbitals shorter, but still long and strong, ocellars comparatively short and weak, about half as long as postverticals; third antennal segment about 1.5 as long as wide; arista long plumose; hairs on lower part of sides of face very fine and regular. Thorax with three pairs of strong postsutural dorsocentrals, the anterior pair at suture, and three pairs of long acrostichals, the anterior pair a little in front of

suture; anterior sternopleural small and weak. Hypopygium as Figure 94. Fore femur with anteroventral comb, the setulae shorter than usual; mid tibia with one long and two short apical ventral bristles; no other distinctive characters of hairing or bristling. Venation as Figure 42.

Length, 3 mm.

Locality.—Mount Maquiling, Luzon (C. F. Baker). The type was from Luzon also.

HOMONEURA (HOMONEURA) AFFINIS, new species

This species is very similar to *sublucida*, the hypopygium of which is shown in Figure 88, being shining fulvous in color, with the ocellar spot and apex of third antennal segment black, the wings greyish hyaline, and the parafacials conspicuously white dusted.

Most of the structural details of the two species are the same, but the anterior orbital bristle is less than half as long as posterior one in *affinis*, and the hypopygium is as Figure 87.

Length, 3 mm.

Type.—Cat. No. 40345, U.S.N.M. *Type*, Cuernos Mts., Negros (C. F. Baker), and *paratypes*, Puerto Princesa, Palawan Is. (R. C. McGregor) (United States National Museum), and Philippine Islands, without more definite locality (Osten Sacken collection).

HOMONEURA (HOMONEURA) SUBLUCIDA, new species

Male.—For characters see above species and key.

Type.—Male, Cat. No. 41699, U.S.N.M.; Kolumbugan, Mindanao (C. F. Baker). Two paratypes, same data.

HOMONEURA (HOMONEURA) GRAHAMI, new species

Male and female.—Testaceous yellow, but slightly shining. Ocellar region not blackened; antennae and palpi yellow; parafacials not dusted. Thorax not vittate. Abdomen unicolorous. Legs testaceous yellow. Wings similar to those of *laticosta* Thomson, quite deeply browned along costa, the dark color fading out at about third vein, and both cross veins slightly clouded.

Frons a little longer than wide, orbits but slightly differentiated, anterior orbital about as long as posterior one, ocellars long; antennae short; arista distinctly pubescent; face slightly convex. Thorax with the usual bristles, and the intradorsocentral hairs in six series. Abdomen robust in male, the seventh tergite with a pronounced hump in middle at base, beyond which it is precipitous. Fore femur with an anteroventral comb; all tibiae with preapical dorsal bristle, the one on hind tibia very short and fine.

Length, 3.5 mm.

Type.—Male, Cat. No. 40346, U.S.N.M. *Type*, male, Shin Kai Si, Mount Omei, Szechuen, China, 4,000 feet; *allotype*, Suifu, Szechuen, China (D. C. Graham). United States National Museum.

HOMONEURA (HOMONEURA) TRYPETOPTERA (Hendel)

Lauzania trypetoptera HENDEL, Genera Insectorum, fasc. 68, pl. 3, fig. 63, no description, 1908.

This species has much the appearance of a *Trypaneoides*, but lacks the discal bristle on the mesopleura. It is closely related to *picta* (de Meijere), but may be readily distinguished from it by the characters listed in the foregoing key.

One specimen, Tangcolan, Bukidnon, P. I. (C. F. Baker).

The above specimen bears the number 19154 in the late C. F. Baker's writing and was found in the box containing Trypetidae in his collection. As these numbers were placed upon specimens which were considered to be conspecific with others sent out for identification I assume that at least one other was submitted to the late Dr. M. Bezzi and is now in his collection.

HOMONEURA (HOMONEURA) PICTA (de Meijere)

Sapromyza picta DE MEIJERE, Tijdschr. v. Ent., vol. 51, p. 114, 1908.

There is a Sumatran specimen of this species in the United States National Museum collection taken at Brastagi, May, 1927 (F. J. Meggitt).

HOMONEURA (HOMONEURA) IMMACULATA (de Meijere)

Lauzania immaculata DE MEIJERE, Tijdschr. v. Ent., vol. 53, p. 123, 1910.

One female of this species in the United States National Museum collection is from Brastagi, Sumatra, May, 1927 (F. J. Meggitt).

HOMONEURA (HOMONEURA) PLEURIPUNCTA Malloch

Homoneura (Homoneura) pleuripuncta MALLOCH, Suppl. Ent., vol. 15, 1927, p. 110.

This species is represented in the United States National Museum collection by a male collected at Brastagi, Sumatra, May, 1927 (F. J. Meggitt).

It is known only from Sumatra.

SYSTEMATIC ARRANGEMENT OF THE SPECIES IN THE KEY^{*}

Genus HOMONEURA van der Wulp

Subgenus CHAETHOMONEURA Malloch

- | | |
|------------------------------|------------------------------|
| 1. anthrax Malloch. | 5. gedehi (de Meijere). |
| 2. semibrunnea (de Meijere). | 6. obscuriceps (de Meijere). |
| 3. umbrosa Malloch. | 7. kocki Malloch. |
| 4. fumibasis Malloch. | 8. nigrofulva Malloch. |

^{*} The species in italics occur in the Philippines.

Subgenus GRIPHONEUROIDES Malloch

- | | |
|---------------------------------------|--------------------------------------|
| 9. <i>obscuricornis</i> (de Meijere). | 15. <i>fuscipes</i> (Kertesz). |
| 10. <i>astrolabei</i> (Kertesz). | 16. <i>testaceipes</i> (Kertesz). |
| 11. <i>wallacei</i> (Malloch). | 17. <i>papuana</i> (Kertesz). |
| 12. <i>atricornis</i> (Kertesz). | 18. <i>chyzeri</i> (Kertesz). |
| 13. <i>flavicornis</i> (Kertesz). | 19. <i>octoguttata</i> (de Meijere). |
| 14. <i>distincta</i> (Kertesz). | |

Subgenus POECILOMYZA Malloch

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|-------------------------------|--|
| 20. <i>boettcheri</i> (Frey). | |
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Subgenus NEOHOMONEURA Malloch

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|-----------------------------------|------------------------------------|
| 21. <i>aberrans</i> (de Meijere). | 28. <i>indica</i> Malloch. |
| 22. <i>albicosta</i> Malloch. | 29. <i>limbifera</i> (de Meijere). |
| 23. <i>setiventris</i> Malloch. | 30. <i>macgregori</i> Malloch. |
| 24. <i>lugubris</i> (de Meijere). | 31. <i>karnyi</i> Malloch. |
| 25. <i>yerburyi</i> Malloch. | 32. <i>orientalis</i> (Wiedemann). |
| 26. <i>jacobsoni</i> Malloch. | 33. <i>paroecca</i> (Kertesz). |
| 27. <i>honesta</i> (Kertesz). | 34. <i>nigronotata</i> (Kertesz). |

Subgenus XENOHOMONEURA Malloch

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|------------------------------|--|
| 35. <i>testacea</i> Malloch. | |
|------------------------------|--|

Subgenus EUHOMONEURA Malloch

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|---------------------------------|---------------------------------------|
| 36. <i>nigristua</i> Malloch. | 38. <i>lunipennis</i> (de Meijere). |
| 37. <i>lunata</i> (de Meijere). | 39. <i>ornatipennis</i> (de Meijere). |

Subgenus MINETTIROIDES Malloch

- | | |
|--------------------------------------|---------------------------------------|
| 40. <i>fumipennis</i> Malloch. | 42. <i>crassiuscula</i> (de Meijere). |
| 41. <i>parvinotata</i> (de Meijere). | |

Subgenus HOMONEURA van der Wulp

- | | |
|--|---------------------------------------|
| 43. <i>piliseta</i> Malloch. | 59. <i>maculifera</i> (de Meijere). |
| 44. <i>exigua</i> (de Meijere). | 60. <i>crinita</i> Malloch. |
| 45. <i>coffeata</i> (de Meijere). | 61. <i>hirtitibia</i> Malloch. |
| 46. <i>nudiseta</i> (Kertesz). | 62. <i>strigipennis</i> (de Meijere). |
| 47. <i>hawaiiensis</i> Malloch. | 63. <i>dentifera</i> Malloch. |
| 48. <i>curta</i> Malloch. | 64. <i>opposita</i> Malloch. |
| 49. <i>nudifrons</i> (Kertesz). | 65. <i>maquilingensis</i> Malloch. |
| 50. <i>crassicauda</i> Malloch. | 66. <i>trispina</i> Malloch. |
| 51. <i>diacrostichalis</i> Malloch. | 67. <i>folifera</i> Malloch. |
| 52. <i>acrostichalis</i> (de Meijere). | 68. <i>opacithorax</i> Malloch. |
| 53. <i>philippinensis</i> Malloch. | 69. <i>signatifrons</i> (Kertesz). |
| 54. <i>pubiseta</i> (Kertesz). | 70. <i>piceoides</i> Malloch. |
| 55. <i>costalis</i> Malloch. | 71. <i>nigrita</i> Malloch. |
| 56. <i>padangensis</i> (de Meijere). | 72. <i>luzonensis</i> Malloch. |
| 57. <i>intermedia</i> Malloch. | 73. <i>robusta</i> Malloch. |
| 58. <i>horni</i> Malloch. | 74. <i>atriceps</i> Malloch. |

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|---|--|
| 75. <i>bilincella</i> (Frey). | 110. <i>pallidula</i> Malloch. |
| 76. <i>nothosticta</i> (Frey). | 111. <i>diversa</i> (Kertesz). |
| 77. <i>notostigma</i> (Kertesz). | 112. <i>geomyzina</i> (Frey). |
| 78. <i>demeijerii</i> Malloch. | 113. <i>grahami</i> Malloch. |
| 79. <i>bakeri</i> Malloch. | 114. <i>discoidalis</i> (Kertesz). |
| 80. <i>leucoprosopon</i> (de Meijere). | 115. <i>dichroa</i> (de Meijere). |
| 81. <i>ornatifrons</i> (de Meijere). | 116. <i>nigripennis</i> (de Meijere). |
| 82. <i>viatrix</i> (de Meijere). | 117. <i>tryptoptera</i> (Hendel). |
| 83. <i>toxopeus</i> Malloch. | 118. <i>picta</i> (de Meijere). |
| 84. <i>beckeri</i> (Kertesz). | 119. <i>quinquevittata</i> (de Meijere). |
| 85. <i>fasciventris</i> Malloch. | 120. <i>quinquevittata</i> var. <i>formosana</i>
Malloch. |
| 86. <i>occipitalis</i> Malloch. | 121. <i>pleuripuncta</i> Malloch. |
| 87. <i>immaculata</i> (de Meijere). | 122. <i>caloptera</i> (Kertesz). |
| 88. <i>circumcincta</i> (Frey). | 123. <i>latifrons</i> Malloch. |
| 89. <i>trifasciata</i> (de Meijere). | 124. <i>subvittata</i> Malloch. |
| 90. <i>immaculipennis</i> Malloch. | 125. <i>talamaui</i> (de Meijere). |
| 91. <i>signata</i> (van der Wulp). | 126. <i>ungaranensis</i> (de Meijere). |
| 92. <i>bioculata</i> (de Meijere). | 127. <i>angustata</i> (de Meijere). |
| 93. <i>neosignata</i> Malloch. | 128. <i>strigata</i> (de Meijere). |
| 94. <i>kerteszi</i> (de Meijere). | 129. <i>medionotata</i> (de Meijere). |
| 95. <i>mcldiosignata</i> (Frey). | 130. <i>flavomarginata</i> (Kertesz). |
| 96. <i>biguttata</i> (Macquart). | 131. <i>chinensis</i> Malloch. |
| 97. <i>halterata</i> (Kertesz). | 132. <i>grandis</i> (Kertesz). |
| 98. <i>novaegulneae</i> (Kertesz). | 133. <i>varinervis</i> (Kertesz). |
| 99. <i>biori</i> (Kertesz). | 134. <i>bistriata</i> (Kertesz). |
| 100. <i>grossa</i> (de Meijere). | 135. <i>striatifrons</i> (de Meijere). |
| 101. <i>fuscobrunnea</i> Malloch. | 136. <i>beccari</i> (Kertesz). |
| 102. <i>nigroapicata</i> Malloch. | 137. <i>lorentzi</i> (Kertesz). |
| 103. <i>simplisissima</i> (de Meijere). | 138. <i>vankamperi</i> (de Meijere). |
| 104. <i>sauteri</i> Malloch. | 139. <i>quinenotata</i> (de Meijere). |
| 105. <i>affinis</i> Malloch. | 140. <i>brevicornis</i> (Kertesz). |
| 106. <i>sublucida</i> Malloch. | 141. <i>punctipennis</i> (de Meijere). |
| 107. <i>laticosta</i> (Thomson). | 142. <i>preapicalis</i> Malloch. |
| 108. <i>lucida</i> (de Meijere). | 143. <i>bancrofti</i> Malloch. |
| 109. <i>unguiculata</i> (Kertesz). | |

NOTES ON SOME OF DOCTOR FREY'S PHILIPPINE SPECIES

The generic name *Mallochomyza* I consider synonymous with *Homoneura*, but the species referred here by Doctor Frey do not belong to the same group as *picea* van der Wulp, which species and other two he retains in *Homoneura* *sen. str.*

HOMONEURA (HOMONEURA) SERIEPUNCTATA (Frey)

Mallochomyza seriepunctata FREY, Acta Soc. pro Fauna et Flora Fennica, vol. 56, No. 8, p. 32, 1927.

I have seen no species from the Philippines which might be this. It must be very similar to *latifrons* Malloch described from Formosa, but it is evidently smaller, the extreme length given by Frey being 4 mm. while that of *latifrons* is 6 mm. The description of *seriepunctata* mentions the fact that the clouds on apices of third and fourth

veins are confluent, but in *latifrons* the one on fourth is faint and separated from the one on third. Frey states that in his species the spaces between the three dark spots on third vein are whitish, which is not the case in the other species.

Locality, Manila, Luzon.

MALLOCHOMYZA SUBGEMINATA Frey

Mallochomyza subgeminata FREY, Acta Soc. pro Fauna et Flora Fennica, vol. 56, No. 8, p. 28, 1927.

MALLOCHOMYZA CONTUBERNALIS Frey

Mallochomyza contubernalis FREY, Acta Soc. pro Fauna et Flora Fennica, vol. 56, No. 8, p. 29, 1927.

I am unable to determine the status of the above two species, but incline to think that they may belong to *Trypaneoides*.

MALLOCHOMYZA TERMINATA Frey

Mallochomyza terminata FREY, Acta Soc. pro Fauna et Flora Fennica, vol. 56, No. 8, p. 30, 1927.

Probably a *Homoneura*, but not amongst my material apparently.

MALLOCHOMYZA BUTUANENSIS Frey

Mallochomyza butuanensis FREY, Acta Soc. pro Fauna et Flora Fennica, vol. 56, No. 8, p. 31, 1927.

Apparently a species of *Homoneura*, but not known to me.

MALLOCHOMYZA TETRURA Frey

Mallochomyza tetrura FREY, Acta Soc. pro Fauna et Flora Fennica, vol. 56, No. 8, p. 35, 1927.

Close to *signata* van der Wulp. Impossible to state definitely without specimens for comparison. Undoubtedly a *Homoneura*.

MALLOCHOMYZA SPICULATA Frey

Mallochomyza spiculata FREY, Acta Soc. pro Fauna et Flora Fennica, vol. 56, No. 8, p. 36, 1927.

Possibly identical with *bioculata* de Meijere. A *Homoneura*.

MALLOCHOMYZA TAGALICA Frey

Mallochomyza tagalica FREY, Acta Soc. pro Fauna et Flora Fennica, vol. 56, No. 8, p. 38, 1927.

Appears to be close to if not identical with *simplissima* de Meijere. *Homoneura*.

Genus HIMANTOPYGA Frey

The above genus was compared with *Sapromyza* Fallen by Doctor Frey, who distinguished it essentially by its more slender form, its much developed male hypopygium, and the projecting labrum. The prescutellar acrostichals are absent and all the tibiae have a long preapical dorsal bristle.

HIMANTOPYGA SCAPTOMYZINA Frey

Himantopyga scaptomyzina FREY, Acta Soc. pro Fauna et Flora Fennica, vol. 56, No. 8, p. 41, 1927.

This is the genotype and only species of the genus known. The head is reddish yellow, occiput black, frons bare, orbits and ocellar spot black, with gray dust; orbitals both strong, the anterior pair not much shorter than the posterior pair; antennae black, third segment quite large, broadly oval, about 1.5 as long as wide; arista almost bare; palpi yellow to brownish. Thorax and scutellum shining black, with slight gray dust, the humeri and sutures yellowish; three dorso-centrals, acrostichals in six series, two sternopleurals present; scutellum somewhat pointed. Abdomen black, shining, in the female yellowish at base on sides. Legs yellow, apical tarsal segment browned. Wings rather long and pointed, yellowish grey tinged, especially on the costa.

Length, 3-3.25 mm.

Localities.—Balbalasan and St. Thomas, Luzon.

Genus POICHILUS Frey

This genus also is unknown to me. I append some notes taken from Doctor Frey's published description.

Said to have much in common with the genus *Mycterella* Kertész. The arista is long haired and the eyes have a different form. Also near *Rhagadolyra* Hendel.

Ocellars very short and fine, two verticals and two orbitals, all strong and equal; face convex; basal antennal segment shorter than second, third slender, about five times as long as wide; arista dorsal, basal, twice as long as third antennal segment, and with long dense hairs on each side; prelabrum hardly projecting; palpi normal. Thorax with three pairs of postsutural dorsocentrals, one pair of prescutellar acrostichals, two sternopleurals, the scutellum large, flattened, rounded in outline, with four bristles. All tibiae with preapical dorsal bristle. Second and third wing veins slightly undulated.

POICHILUS FASCIATUS Frey

Poichilus fasciatus FREY, Acta Soc. pro Fauna et Flora Fennica, vol. 56, No. 8, p. 19, 1927.

This is the genotype and only known species of the genus. The head is yellow, with three black spots on frons and four on face; antennae and palpi yellow. Thorax and scutellum yellow, dorsum with four broad brown vittae which extend over scutellum, pleura with two similar vittae. Abdomen reddish brown, with sides black brown. Legs yellow, femora at bases more or less brown and before the apices with a brown ring, all tibiae with three brown rings, fore tarsi entirely, and apical segment of other tarsi, black-brown. Wings conspicuously marked with brown, in the form of two longitudinal streaks, the first over the costa, the second over the fifth vein, the costal one with a pale streak and two spots in it, the posterior one irregular and more or less broken with pale spots.

Length, 6 mm.

Localities.—Surigao and Siargao, Mindanao.

APPENDIX

GRIPHOMINETTIA, new genus

This genus has the face as in *Minettia longipennis* Fabricius, with two pronounced humps on lower half, and also has the intra-alar bristle strong, and the costal setulae as in that genus. The fourth wing vein is strongly curved forward near its apex, forming a broadly rounded bend as in *Griphoneura* and most species of the subgenus *Griphoneuroides* of *Homoneura*, the first posterior cell being almost, or quite, closed at margin of wing. The fore femur lacks the pre-apical anteroventral comb of minute black setulae, which is another feature distinguishing the genus from *Homoneura*.

Genotype.—The following species.

GRIPHOMINETTIA SUMATRANA, new species

Male.—Head black, centre and anterior margin of frons brownish; antennae fuscous, second segment yellowish; palpi black. Thorax black, shining, slightly gray dusted; humeral angles, anterior and posterior portions of pleura, the postalar region, and the metanotum, fulvous yellow. Abdomen glossy black, hypopygium brownish. Legs yellow, tarsi, and especially the fore pair, darkened. Wings hyaline, veins brown, yellow at bases. Calyptrae and halteres yellow.

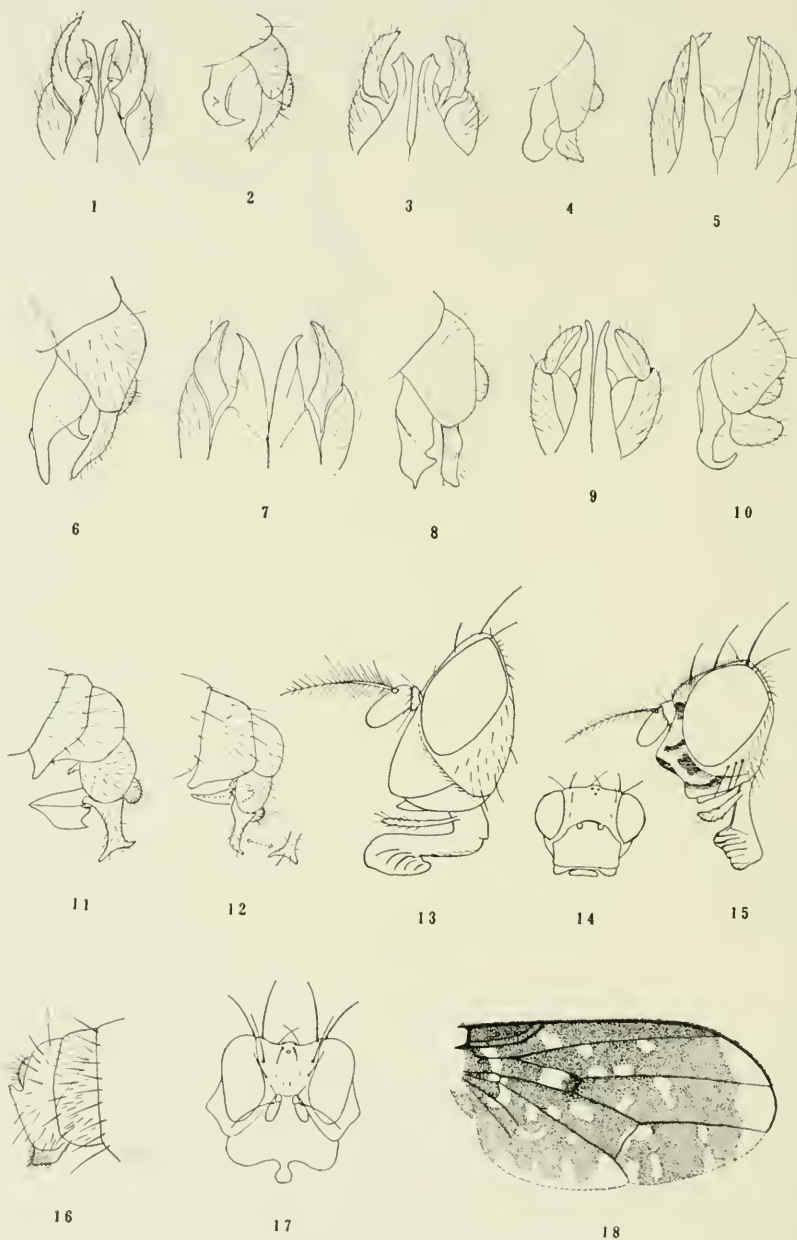
Frons a little longer than wide, all bristles long; face widened below; third antennal segment about twice as long as wide; arista with its longest hairs not as long as width of third antennal segment;

lower occipital bristles strong. Thorax with 3 pairs of postsutural dorsocentrals, one pair of prescutellar acrostichals, two sternopleurals, the scutellum slightly flattened and with four bristles. Hypopygium small, forceps short and wide. Preapical bristle strong on all tibiae; mid tibia with two long apical ventral bristles. Inner cross vein slightly before middle of discal cell.

Length, 5.5 mm.

Type.—Brastagi, Sumatra, May 1927 (F. J. Meggitt). U.S.N.M. Cat. No. 40878.

It is possible, but not probable, that some of the species which I have not seen that are placed by me in *Griphoneuroides* belong to this genus.



DETAILS OF CELYPHINAE AND SAPROMYZINAE

FOR EXPLANATION OF PLATE SEE PAGE 89

EXPLANATION OF PLATES

PLATE 1

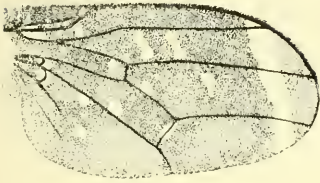
Details of Celyphinae and Sapromyzinae

- FIG. 1. *Spaniocelyphus scutatus*, hypopygium of male, from rear.
2. *Spaniocelyphus scutatus*, hypopygium of male, from side.
3. *Spaniocelyphus formosanus*, hypopygium of male, from rear.
4. *Spaniocelyphus formosanus*, hypopygium of male, from side.
5. *Acelyphus stigmaticus*, hypopygium of male, from rear.
6. *Acelyphus stigmaticus*, hypopygium of male, from side.
7. *Spaniocelyphus sumatranus*, hypopygium of male, from rear.
8. *Spaniocelyphus sumatranus*, hypopygium of male, from side.
9. *Acelyphus politus*, hypopygium of male, from rear.
10. *Acelyphus politus*, hypopygium of male, from side.
11. *Steganopsis melanogaster*, hypopygium of male, from side.
12. *Steganopsis convergens*, same.
13. *Xangelina basiguttata*, head, from side.
14. *Xangelina basiguttata*, head, from front.
15. *Euprosopomyia maculosa*, head, from side.
16. *Euprosopomyia maculosa*, hypopygium, from side.
17. *Prosopophorella buccata*, head, from front.
18. *Phobeticomyia lunifera*, wing.

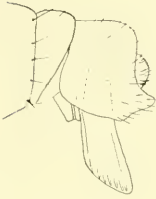
PLATE 2

Details of Sapromyzinae

- FIG. 19. *Phobeticomyia preapicalis*, wing.
20. *Minettia tubifera*, hypopygium from side.
 21. *Minettia nigrohalterata*, same, from below.
 22. *Minettia nigrohalterata*, same, from side.
 23. *Minettia fuscofasciata*, same, from below.
 24. *Minettia quadrispinosa*, same.
 25. *Minettia obscura*, same.
 26. *Minettia luteitarsis*, same.
 27. *Minettia philippinensis*, same, from behind.
 28. *Trigonometopus bakeri*, hypopygium, from side.
 29. *Kertcszomyia maculifrons*, head, from side.
 30. *Ichthomyia cyprinus*, same.
 31. *Homoneura semibrunnea*, hypopygium from side, and apex of inner forceps, from behind.
 32. *Homoneura umbrosa*, same.
 33. *Homoneura fumibasis*, same.



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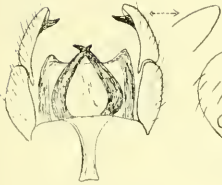
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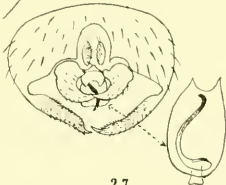
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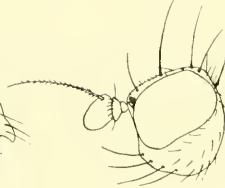
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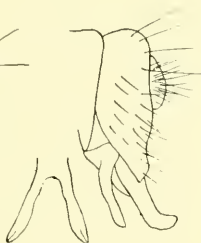
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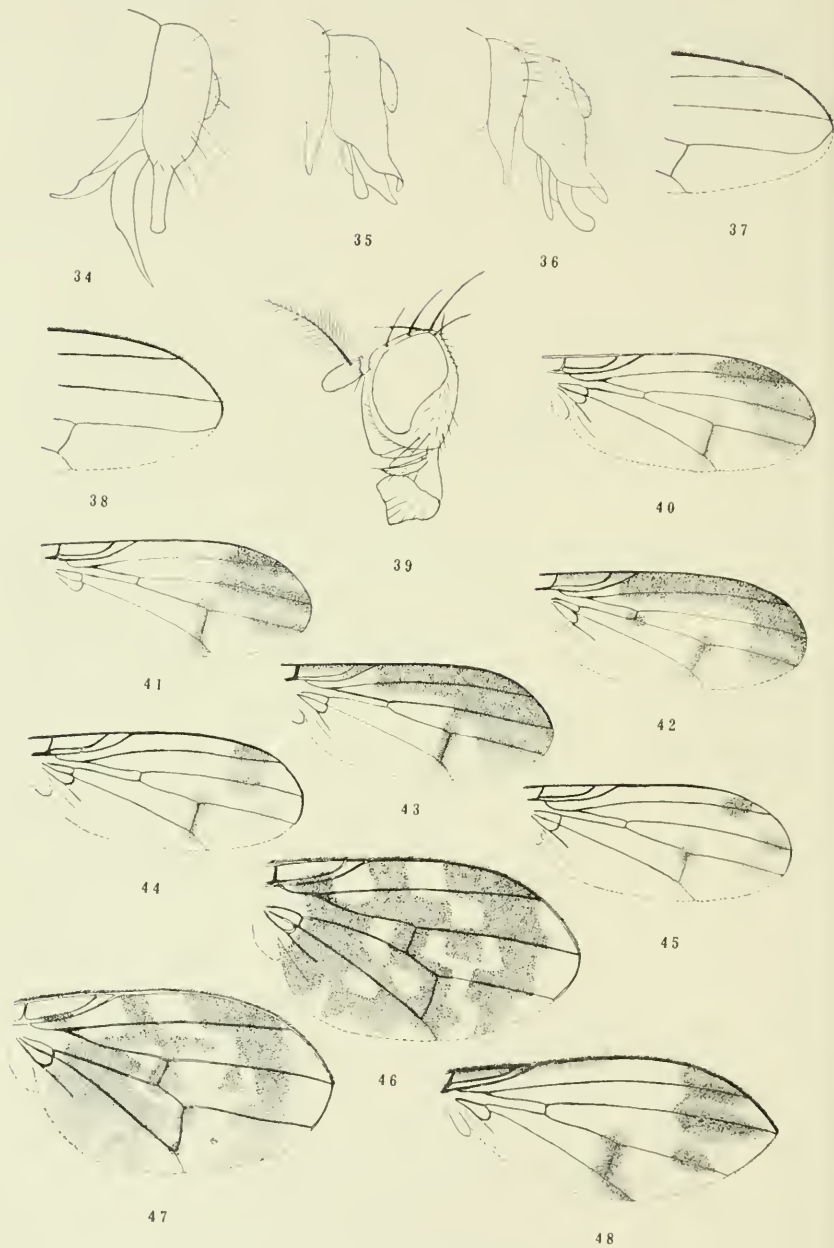
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DETAILS OF SAPROMYZINAE

FOR EXPLANATION OF PLATE SEE PAGE 90



DETAILS OF HOMONEURA

FOR EXPLANATION OF PLATE SEE PAGE 91

PLATE 3

Details of *Homoneura*

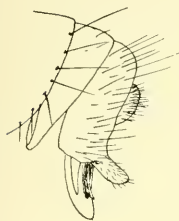
- FIG. 34. *Homoneura gedehi*, hypopygium, from side.
35. *Homoneura kocki*, same.
36. *Homoneura nigrofulva*, same.
37. *Homoneura testaceipes*, apex of wing.
38. *Homoneura octoguttata*, same.
39. *Homoneura albicosta*, head, from side.
40. *Homoneura jacobsoni*, wing.
41. *Homoneura honesta*, wing.
42. *Homoneura limbifera*, same.
43. *Homoneura orientalis*, same.
44. *Homoneura paroeca*, same.
45. *Homoneura nigronotata*, same.
46. *Homoneura nigriftua*, same.
47. *Homoneura lunata*, same.
48. *Homoneura geomyzina*, same.

PLATE 4

Hypopygia of *Homoneura* species

FIG. 49. *Homoneura honesta*, hypopygium from side.

- 50. *Homoneura parvinotata*, same.
- 51. *Homoneura hawaiiensis*, same.
- 52. *Homoneura curta*, same.
- 53. *Homoneura nudifrons*, same.
- 54. *Homoneura crassicauda*, same.
- 55. *Homoneura acrostichalis*, same.
- 56. *Homoneura philippinensis*, same.
- 57. *Homoneura pubiseta*, same.
- 58. *Homoneura padangensis*, same.
- 59. *Homoneura intermedia*, same.
- 60. *Homoneura horni*, same.
- 61. *Homoneura strigipennis*, same.
- 62. *Homoneura dentifera*, same.
- 63. *Homoneura opposita*, same.
- 64. *Homoneura maquilingensis*, same.
- 65. *Homoneura trispina*, same.



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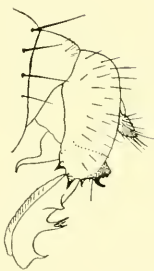
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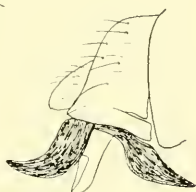
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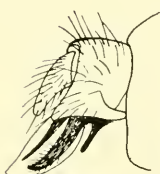
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HYPOPYGIA OF SPECIES OF HOMONEURA

FOR EXPLANATION OF PLATE SEE PAGE 92



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HYPOPYGIA OF SPECIES OF HOMONEURA

FOR EXPLANATION OF PLATE SEE PAGE 93

PLATE 5

Hypopygia of *Homoneura* species

- FIG. 66. *Homoneura folifera*, hypopygium from side.
67. *Homoneura piceoides*, same.
68. *Homoneura nigrita*, same.
69. *Homoneura bilinecella*, same.
70. *Homoneura nothosticta*, same.
71. *Homoneura notostigma*, same from side.
72. *Homoneura notostigma*, same from side below.
73. *Homoneura demeijerii*, same from side.
74. *Homoneura demeijerii*, same from side below.
75. *Homoneura bakeri*, hypopygium from side.
76. *Homoneura leucoprosopon*, same.
77. *Homoneura beckeri*, same.
78. *Homoneura beckeri*, same, internal portions, one side from below.
79. *Homoneura fasciventris*, same, and apex of inner forceps.
80. *Homoneura occipitalis*, same.
81. *Homoneura immaculipennis*, same.
82. *Homoneura signata*, same.

PLATE 6

Hypopygia and apical genital segments of *Homoneura* species

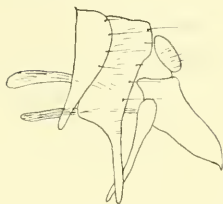
- FIG. 83. *Homoneura grossa* ?, hypopygium from side.
84. *Homoneura fuscobrunnea*, same.
85. *Homoneura nigroapicata*, same.
86. *Homoneura sauteri*, same.
87. *Homoneura affinis*, same.
88. *Homoneura sublucida*, same.
89. *Homoneura laticosta*, same.
90. *Homoneura lucida*, same.
91. *Homoneura unguiculata*, same.
92. *Homoneura pallidula*, same.
93. *Homoneura diversa*, same.
94. *Homoneura gcomyzina*, same.
95. *Homoneura dichroa*, same.
96. *Homoneura chinensis*, same.
97. *Homoneura signatifrons*, apex of venter of female abdomen.
98. *Homoneura* species, same.



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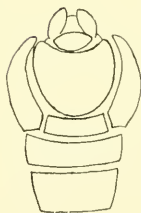
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HYPOPYGIA AND APICAL GENITAL SEGMENTS OF SPECIES OF HOMONEURA

FOR EXPLANATION OF PLATE SEE PAGE 94

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[Valid genera and species in roman; subgenera in parentheses; synonyms in italics.]

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A REVISION OF THE WOOD-WARBLER GENUS BASILEUTERUS AND ITS ALLIES

By W. E. CLYDE TODD

Of the Carnegie Museum, Pittsburgh, Pennsylvania

INTRODUCTION

The studies in systematic ornithology in which the writer has been engaged have served to show how far we still are from a proper understanding of the status and relationships of sundry familiar avian groups, and how many distributional problems concerning them still remain to be solved. The identification of specimens often involves extensive comparisons, and when it comes to the revision of a group as large as *Basileuterus*, the collection of no single institution is adequate for the purpose, and only by pooling all available resources can such a study be carried out. Some return is surely due those whose help must be sought before a paper of this kind can be produced, while the time and labor devoted to the research in question would seem to justify placing the full results on record for the benefit of other workers in the same field.

In preparing the present revision the writer has handled no less than 2,615 specimens, of which 231 are in the collection of the United States National Museum, including that of the Biological Survey. The remainder were drawn from the collections of the following American institutions: The American Museum of Natural History, the Museum of Comparative Zoölogy, the Carnegie Museum, the Academy of Natural Sciences of Philadelphia, and the Field Museum of Natural History, all of which contributed their full series of this group. From abroad small but important loans of material were made by the Senckenbergische Naturforschende Gesellschaft of Frankfort-am-Main, Germany, the Musée Polonais d'Histoire Naturelle of Warsaw, Poland, the museum of the Université de Neuchâtel, Switzerland, and the British Museum (Natural History) of London, England. To the authorities of these several institutions thanks are due for such courtesies extended. The writer is under obligations also to Mr. Donald R. Dickey of Pasadena, Calif., for the loan of certain pertinent specimens from Salvador, and to Dr.

C. E. Hellmayr of the Field Museum for some important information concerning specimens and localities. Dr. Charles W. Richmond of the United States National Museum has given advice on some points in nomenclature, while Mr. Ernest G. Holt has compiled most of the references for the synonymy.

One of the handicaps under which American ornithologists have long labored has been the difficulty of consulting type specimens contained in the various European museums, leading to much uncertainty and misapprehension as to the application of certain names. Of the 39 types examined in preparing the present paper 4¹ came from collections in Europe, having been sent by special request. The privilege of seeing these and the other types has been a boon not to be valued lightly. Sixty-seven forms are recognized in the present review, of which six are here described as new subspecies. In spite of the unrivalled series brought together, there remain several forms still inadequately represented by specimens, and others whose distribution is as yet imperfectly known.

The literature of the group has been thoroughly searched, and the references have all been personally verified. In order to reduce the bulk of the paper somewhat it has been decided to omit all references not serving some useful purpose, including those found in mere lists of species like Sharpe's "Hand-List," etc. The measurements² are all in millimeters, and the length of the bill is that of the exposed culmen. Unless otherwise specified, averages are based on a series of 10 specimens. The names of colors are mostly taken from Mr. Ridgway's "Color Standards and Color Nomenclature."

TAXONOMIC HISTORY

The history of this group goes back to 1821, when Maximilian, Prince of Wied, described *Muscicapa rivularis* from Brazil. In 1823 we have *Muscicapa stragulata* of Lichtenstein, a synonym of Wied's species, and *Sylvia leucoblepharides* of Vieillot, the latter redescribed by Swainson in 1838 as *Trichas superciliosus*. *Muscicapa fulvicauda* of Spix, another species from Brazil, was described in 1825. *Sylvia culicivora* of Lichtenstein came out in 1830, and *Muscicapa bivittata* of Lafresnaye and D'Orbigny in 1837. *Setophaga auricapilla* of Swainson also appeared about the same time. Giraud, in his celebrated paper on Texas birds in 1841, named *Muscicapa brasieri* and *M. belli*, and in 1845 Bonaparte described *Trichas luteoviridis*. About the same time von Tschudi described three new species from Peru, *Myiodioctes coronatus*, *M. tristriatus*, and *Setophaga chrysogaster*. He seems to have had a better idea

¹ *Myiodioctes coronatus* von Tschudi, *Basileuterus signatus* von Berlepsch and Stolzmann, *Setophaga chrysogaster* von Tschudi, and *Myiodioctes tristriatus* von Tschudi.

² Mr. M. Graham Netting is responsible for making some of the measurements.

of the real affinities of his new species than most of his predecessors had of theirs in the same group. This brings us down to the year 1847 with eleven valid names for species pertaining to the group called *Basileuterus* by Cabanis.

There is, however, an unfortunate complication affecting the name in question. Some authors date it from the *Archiv für Naturgeschichte* (vol. 13, pt. 1, 1847, p. 316), but there it is only a *nomen nudum*. The proper citation is apparently Schomburgk, "Reisen in British-Guiana (vol. 3, 1848, p. 666)." Here it is duly characterized, and one species, "*B. vermivorus* Cab.," is placed under it, which thus becomes the type by monotypy. But the specific name here used is not original with Cabanis; it is taken from Vieillot, as shown in the second reference quoted. Cabanis merely transfers Vieillot's species to his new genus *Basileuterus*. Now, it so happens that the *Sylvia vermivora* of Vieillot refers primarily to the *Motacilla vermivora* of Gmelin, the worm-eating warbler. The case has been fully discussed by von Berlepsch.³ Hence by a literal interpretation of the rules *Basileuterus* Cabanis becomes a synonym of *Helmitheros* Rafinesque, 1819. This is a pitiable end for a perfectly good generic name.⁴ But there is another rule, not formulated in any code and not in favor with the literalist, which we feel ought to be invoked at this point. This is the rule of common sense, which says that the bird Cabanis had in mind for the type of his new genus was none other than the one now known as *Basileuterus auricapillus olivascens* Chapman. This is clear from his remarks at the time, since he expressly distinguishes the "Contramaestre coronado" of Azara (which he must have supposed to be the base of Vieillot's *Sylvia vermivora*) from the *Helinaea vermivora* of Latham and Audubon. The circumstance that he inadvertently used a name for the former which had been originally applied to another and non-pertinent species ought not to be allowed to overthrow his action, and upset such a peculiarly appropriate and long-established name for a large and important group. The present writer does not care to take the responsibility for making a change under the circumstances, and for the purposes of this paper will continue to use *Basileuterus*.

³ Ibis, 1881, p. 240.

⁴ Dr. Charles W. Richmond, to whose attention this matter was called, writes as follows: "Canon XL of the revised A. O. U. Code seems to fit the case, where you will find in brackets the statement 'A generic name based upon a designated described species takes that species as its type, even though the founder of the genus may have misidentified the species.' * * * In addition to Canon XL of the A. O. U. Code, I think you will find Opinion 65 of the International Nomenclature Commission to bear on the case. In the summary of this opinion in the Proceedings of the Biological Society of Washington for 1926, headed 'Case of a Genus Based upon Erroneously Determined Species,' is the statement, 'If an author designates a certain species as genotype, it is to be assumed that his determination of the species is correct,' etc."

The new generic name came into use almost at once. Bonaparte, writing in 1850, placed 10 species under it, 2 of which he described as new; but not all of those he included are now considered members of the group, while he failed to recognize some others as properly belonging here. Four years later he added another species, *Basileuterus delatirii*, from Nicaragua. The first attempt to treat the genus from the monographic point of view was by Selater, in the Proceedings of the Zoological Society of London for 1865 (pp. 282-286). Here he listed 15 forms known to him, giving colored figures of four of them, with diagnoses and references. He had already described four new species between 1860 and 1864, and gave another in this last paper. Baird's review of the group appeared about the same time. He treated the seven species recognized from north of Panama at some length, and gave a list of 11 others from South America. Besides describing one species as new, he set up a new subgenus, *Idiotes*, based on *Setophaga rufifrons* of Swainson as type. His critical discussion of the characters and relationships of *Basileuterus* and related genera was well brought out, and may still be consulted with profit. He recognized *Myiothlypis* Cabanis as a good genus, and assigned to it a provisional new species, *flaveolus*, described from a single specimen from Paraguay. (*Myiothlypis* had been originally based on *Trichas nigrocristatus* Lafresnaye, with which Bonaparte had associated his *Trichas luteoviridis*, while Cabanis had described a *Myiothlypis striaticeps* in 1873.)

In the next 20 years no less than 10 new species were described by various authors, and of these names only one is now rated as a synonym. This brings us to Sharpe's review of the genus, which appeared in volume 10 of the "Catalogue of the Birds in the British Museum." He recognized 32 species and 3 additional "subspecies," of which total of 35 forms 5 are here described and named for the first time. Sharpe's descriptions are as always carefully drawn up: his lists of references are reasonably full, and his names generally acceptable. Yet his treatment of the group, standing as it does for the latest revision available to the student, is open to criticism in one important respect. The sequence of the species is not natural, related forms being widely separated. The "key to the species" is likewise highly artificial, and as a practical aid in identification is of little use, since it will not work. No real idea of the interrelationships of the various forms of this genus can be obtained from a study of Sharpe's paper.

Coming down to the present century, we find the Middle American forms comprehensively and carefully treated by Mr. Ridgway in his "Birds of North and Middle America."⁵ He offers also some perti-

⁵ Bulletin 50, U. S. National Museum, pt. 2, 1902, pp. 738-758.

nent critical remarks on the characters and scope of the group at large, and of certain extralimital species, but does not venture to formally subdivide it. Two new races are described in the course of his revision. Dubois, in his "Synopsis Avium," published in 1901, gave 26 species and 13 additional "varieties" under the genus. Sharpe in 1909 gave a list of 46 forms in the body of his "Hand-List," and 3 more in the appendix. Brabourne and Chubb, whose work on "The Birds of South America" was based on Sharpe, allowed 30 forms for that continent alone. Altogether 23 new forms of this group have been described since 1900 by the late Count von Berlepsch, Dr. C. E. Hellmayr, Dr. Harry C. Oberholser, Mr. Outram Bangs, Dr. E. W. Nelson, Mr. Robert Ridgway, Mr. Ludlow Griscom, Dr. Frank M. Chapman, and the present writer. Doctor Chapman's contributions to the literature have been noteworthy; he has no less than nine names to his credit, of which only one is now considered a synonym. With so many additions in the last few years, and so many forms still imperfectly understood, the time has seemed ripe for a new revision of the genus, which should attempt to bring our knowledge down to date.

GENERIC LIMITS

Authors are agreed in placing *Basileuterus* in the Setophagine division of the Mniotiltidae, comprising the so-called "flycatching" warblers. Baird indicated its true position many years ago in his "Review of American Birds," and his scheme has been closely followed by Mr. Ridgway. But as to the exact limits of the group there is no such unanimity. Baird recognized *Myiothlypis* Cabanis for the *Trichas nigrocristatus* of Lafresnaye and its allies, and set up a new genus, *Idiotes*, based primarily on *Setophaga rufifrons* Swainson, but including also the other species with the pileum rufous. Mr. Ridgway, on the other hand, would exclude the plainly colored species allied to "*Trichas*" *nigrocristatus*, but does not recognize *Idiotes*. Sharpe in 1909 retained *Myiothlypis* only for *nigrocristatus* and its races (*nigrivertex* and *euophrys*), relegating all the rest of the forms to *Basileuterus*. Thus he went beyond his arrangement of 1885 so far as *Myiothlypis* is concerned.

There was a time when the present writer was inclined to adopt Mr. Ridgway's suggested arrangement of 1902, but more study has convinced him that a further modification is desirable. In the first place, *Myiothlypis* is easily recognizable from *Basileuterus* by its shorter outer primary and vertical crest, but it will be necessary to restrict it to the type species,⁶ as Sharpe has done. This leaves the

⁶ *Basileuterus nigrivertex* Salvin is almost certainly a synonym of *Myiothlypis nigrocristata* (Lafresnaye), while *B. euophrys* Selater and Salvin (not seen by the writer) is probably conspecific.

plainly colored species *luteoviridis*, *signatus*, *flaveolus*, and *richardsoni* in *Basileuterus*. The forms with a short and bicolored tail, as well as those with a long slender tail, must both be removed before any pertinent diagnosis of the genus can be framed. Even with these changes made, there is still much diversity within the group. When we consider the size of this particular group, and remember that after all a genus is a more or less arbitrary assemblage of forms, and is not necessarily sharply cut off from other such groups, to several of which it may approximate, this is what might be expected.

PHYLOGENY

Basileuterus bivittatus may be taken as the central or most generalized form of the genus. It is related on the one hand to such species as *B. flaveolus*, *B. luteoviridis*, etc., which have the under parts yellow, but the pileum plain, and which lead off in the direction of *Myiothlypis*. On the other hand it seems to be allied to *B. griseiceps*, which stands as a connectant between the plainly colored forms typified by *B. rivularis* and those with olive green back, yellow under parts, and heavily streaked pileum of which *B. coronatus* is the best-known example. *B. rivularis* leads off through *B. bolivianus* and *B. mesoleucus* directly to the group which we are here characterizing as *Phaeothlypis*, while *B. coronatus* is not distantly related to *B. fraseri*, which in its turn approximates *Euthlypis*. The smaller species with streaked pileum (*B. auricapillus*, etc.) are obviously inter-related, and run in an unbroken chain, from which *B. tristriatus* is possibly an offshoot. *B. basilicus* and *B. belli* appear to be more or less isolated forms, whose relationships are possibly with *B. tristriatus*. *B. melanogenys*, *B. ignotus*, and *B. bensoni* constitute a compact group of uncertain affinities. *B. delatarii* also stands by itself, and leads off toward *Idiotes*.

To indicate these diverse and complex relationships in a "key" or linear sequence is decidedly out of the question, but they may be partially represented by using two dimensions. The accompanying figure (fig. 1) is an attempt at such a diagrammatic representation, the species alone being considered. It at once suggests how a genus, in the course of its development in time, may have given rise to offshoots so distinct as to require generic separation. In other words, we have here a clue to the origin of genera as such. Virtually all the color characters of *Myiothlypis nigrocristata* are foreshadowed, so to speak, in *Basileuterus luteoviridis* (both species of the Temperate Zone), and this in its turn is similarly related to *B. signatus* of the Subtropical and to *B. flaveolus* of the Tropical Zone. But *Myiothlypis* has developed structural characters of its own, by virtue of which we can separate it generically from *Basileuterus luteoviri-*

outlying genera with their respective affines in *Basileuterus* are such as to render highly probable this view of their relationship. The case of *Phaeothlypis*, however, is not quite so clear; it may have developed independently of *Basileuterus*, and some of its forms may eventually have been modified in the direction of the latter group. In all of the cases here cited we have a good illustration of the persistence and constancy of color characters as an indication of affinities between given forms, while so-called structural characters have been modified. How much weight should be accorded the former in discriminating genera one from the other is an open question, but it is clear that they should be used with caution.

SYNOPSIS OF THE GENERA

(*Basileuterus* and its Allies)

- A.¹ Pileum with a vertical crest; outer primary short-----*Myiothlypis*.
- A.² Pileum plain; outer primary longer.
 - b.¹ Tarsus less than one-third as long as the wing; tail with white terminal spots -----*Euthlypis*.
 - b.² Tarsus one-third as long as the wing, or longer; tail without white terminal spots.
 - c.¹ Tail shorter than the secondaries, bicolored-----*Phaeothlypis*.
 - c.² Tail longer than the secondaries, unicolored.
 - d.¹ Tail shorter than the wing-----*Basileuterus*.
 - d.² Tail longer than the wing, its rectrices narrowed-----*Idiotes*.

The genera *Myiothlypis* and *Euthlypis* (both monotypic) will not be further considered in the present connection. The others will be treated in detail.

PHAEOTHTYLPIS, new genus

Generic characters.—Similar to *Basileuterus*, but with the bill relatively wider, always broader than deep at the nostrils; tail relatively shorter, much less than the distance from the bend of the wing to the end of the longest secondaries, the outstretched feet reaching beyond its tip; and style of coloration very different, the tail being always bicolor, with a pale basal and dark terminal half.

Type.—*Muscicapa fulvicauda* Spix.

Remarks.—It would seem as if this group ought to be removed from *Basileuterus*, if an intelligible diagnosis of the latter is to be achieved. The reduction in length of the tail is a marked feature, and is correlated with a color pattern that is unique in this family. The aquatic habits of the several species, which resemble those of the water thrushes (*Seiurus motacilla* and *S. noveboracensis*) have been commented on by several authors, and are certainly very different from those of the typical *Basileuteri*.

The phylogeny of this genus seems fairly clear from a consideration of the respective geographic ranges of its several members. The

group is strictly confined to the Tropical Zone. *P. fulvicauda* of the upper Amazon, which itself seems allied to a certain section of the genus *Basileuterus*, may be taken as the primitive form. In central and southeastern Peru (in the Amazonian drainage) it has become slightly modified into a recognizable geographic race, *poliothrix*. In the valley of the upper Marañon in northwestern Peru lives still another form, *annexa*, which diverges toward *P. semicervina* of western Ecuador and Colombia. The indications are that *Phaeothlypis*, in common with numerous other avian forms of presumably cis-Andean origin, has crossed the Andes at this point, to extend its range northward on their western side, whence it has passed into the Cauca and Magdalena Valleys. Entering Panama, it has spread northward as far as Honduras, after undergoing further modification. It is not easy to decide how to rank the various forms from a systematic and nomenclatural standpoint. For the present we are recognizing three species, even while admitting that they probably grade into each other, and that their differential characters are not very trenchant. The range of *P. semicervina semicervina* is entirely cut off from that of *P. fulvicauda* by the interposition of the Andean chain, which would tend to justify keeping the two specifically distinct, were it not that the form of the upper Marañon Valley, as already remarked, appears to be much more closely allied to the former than to the latter, which complicates the situation somewhat.

KEY TO THE SPECIES AND SUBSPECIES OF *PHAEOTHTYPIS*

A.¹ Under parts mottled or clouded with brownish.

b.¹ Under parts more whitish, less buffy.

Phaeothlypis leucopygia leucopygia.

b.² Under parts more decidedly buffy—*Phaeothlypis leucopygia veraguensis*.

A.² Under parts without brownish mottling or clouding.

b.¹ Under parts almost uniform buffy.

c.¹ Under parts deeper buffy; terminal band of tail darker, more brownish, less olivaceous—*Phaeothlypis semicervina semicervina*.

c.² Under parts paler buffy; terminal band of tail lighter, more olivaceous, less brownish—*Phaeothlypis semicervina annexa*.

b.² Under parts whitish, the sides and flanks washed with buffy.

c.¹ Above more olivaceous, less brownish; upper tail-coverts and basal part of tail paler buffy—*Phaeothlypis fulvicauda poliothrix*.

c.² Above more brownish, less olivaceous; upper tail-coverts and basal part of tail deeper buffy—*Phaeothlypis fulvicauda fulvicauda*.

PHAEOTHTYPIS LEUCOPYGIA LEUCOPYGIA (Sclater and Salvin)

Basileuterus uropygialis (not of Sclater) LAWRENCE, Ann. Lyc. Nat. Hist. N. Y., vol. 8, 1866, p. 179 (Greytown, Nicaragua); vol. 9, 1868, p. 95 (Angostura and Juiz, Costa Rica).—SALVIN, Proc. Zool. Soc. London, 1867, p. 136, part ([Tucurrique], Costa Rica).—VON FRANTZIUS, Journ. f. Orn., vol. 17, 1869, p. 294 (Costa Rica).—SALVIN, Ibis, 1872, p. 313 (Chontales, Nicaragua; range).—BOUCARD, Proc. Zool. Soc. London, 1878, p. 52 (San Carlos, Costa Rica; habits).

- Basileuterus leucopygius* SCLATER and SALVIN, Nom. Avium Neotrop., 1873, p. 10 (in list of species), p. 156 (Costa Rica; orig. descr.; type now in coll. Brit. Mus.).—SALVIN and GODMAN, Biol. Centr.-Amer., Aves, vol. 1, 1881, p. 172, part (Nicaraguan and Costa Rican localities and refs.; crit.).—NUTTING, Proc. U. S. Nat. Mus., vol. 6, 1884, p. 399 (Los Sábalos, Nicaragua; habits).—SHARPE, Cat. Birds Brit. Mus., vol. 10, 1885, p. 402 (Tucurriqui, Costa Rica; descr.; refs.).—ZELEDON, An. Mus. Nac. Costa Rica, vol. 1, 1887, p. 107 (Angostura and Tuis, Costa Rica).—RIDGWAY, Proc. U. S. Nat. Mus., vol. 10, "1887," 1888, p. 585 (Segovia River, Honduras).—RICHMOND, Proc. U. S. Nat. Mus., vol. 6, 1893, p. 485 (Rio Frio, Nicaragua; habits).—UNDERWOOD, Ibis, 1896, p. 434 (Volcanso Miravalles, Costa Rica).
- Basileuterus semicervinus leucopygius* NUTTING, Proc. U. S. Nat. Mus., vol. 5, 1882, p. 390 ("La Palma," Gulf of Nicoya, Costa Rica; habits).—RIDGWAY, Bull. U. S. Nat. Mus., No. 50, vol. 2, 1902, p. 757 (descr.; range; refs.).—CARRIKER, Ann. Carnegie Mus., vol. 6, 1910, p. 793 (Costa Rican localities and refs.; range; habits).—RENDahl, Ark. f. Zool., vol. 12, No. 8, 1919, p. 36 (Siquirres, Costa Rica).
- Basileuterus fulvicauda gaffneyi* GRISCOM, Amer. Mus. Nov. No. 280, 1927, p. 14 (Guaval, Rio Calovevora, western Panama; orig. descr.; type in coll. Amer. Mus. Nat. Hist.).

Description.—Above dark brownish olive, the pileum darker and more sooty; wings externally like the back; tail deep brown, with more or less olive brown edgings on the terminal half, cream buff on the basal half, together with the upper tail-coverts and lower rump; faintly indicated superciliaries dull buffy, and auricular region more or less mottled or varied with the same color; under parts dull whitish, more or less washed with buffy on the breast and sides, and with obscure brownish mottling on the same parts; under tail-coverts cream buff; under wing-coverts dusky, with whitish mottling; "iris brown; bill black; feet brownish flesh color."

Juvenal plumage: Similar to that of the adult, but duller, especially below, the throat and breast colored like the back; no light markings about the head.

Measurements.—Male: wing, 62–67 (average, 64.5); tail, 50–54 (51); bill, 11–12.5 (12); tarsus, 22–22.5 (22.2). Female: wing, 60–69 (63); tail, 48–52 (50); bill, 11.5–12.5 (12); tarsus, 20–23.5 (22.5).

Range.—Tropical Zone, southern Honduras to Costa Rica (except southwestern part), and thence eastward along the Caribbean slope of western Panama.

Remarks.—At first this bird was confused with its South American congener, "*uropygalis*" (= *fulvicauda*), but was separated in 1873, on the ground of its darker back and lighter-colored rump. Salvin and Godman, writing in 1881, admitted it as distinct from, although closely allied to, *semicervina*, and included Panama in its range. Mr. Ridgway, indeed, rated it as a subspecies of that form, but without actual comparison of specimens. More recently Mr.

Griscom, in describing two proposed new races of this group from western Panama, has called attention to the characters separating *semicervina* (and *fulvicauda*) from *leucopygia*, and has suggested that they may be distinct species. They are certainly different-looking birds, when typical series are compared. The lighter green upper parts, clouded under surface, and more extensively dark and more sharply bicolored rectrices of *leucopygia* are all good characters as compared with *semicervina*. These characters are well pronounced in the three specimens from the Caribbean slope of western Panama, on which Mr. Griscom has based his proposed new race *gaffneyi*. While these at first impressed me as a good form, I find on further examination that they are so close to topotypical *leucopygia* that it is not worth while to keep them distinct. Some variation in the exact type of coloration obtains in birds from all sections so far as the shading of the under parts is concerned, but it is certainly not geographical. The close approach of a race of this spotted-breasted type to the plain-breasted form at the Isthmus of Panama, with (so far) no real evidence of intergradation, induces me to keep the two specifically distinct.

Typical *leucopygia* is a common bird in the Tropical Zone of Costa Rica and Nicaragua, and has been traced as far north as the Segovia River in Honduras. From southwestern Costa Rica eastward along the Pacific slope it is replaced by the next form.

Specimens examined.—Honduras: Segovia River, 1. Nicaragua: Savala, Matagalpa, 1; Las Canas (6 miles E. of Matagalpa), 1; Rio Tuma, 1; Rio Grande, 2; Los Sábalos, 1; Lone Star Falls, near Eden, 2; Pena Blanca, 1. Costa Rica: Pozo Azul de Pirris, 2; Guapiles, 2; Guacimo, 2; Cariblanco de Sarapiquí, 2; Carrillo, 6; El Hogar, 1; Rio Frio, 2; Reventazon, 2; Angostura, 2; Tenorio, 5; La Vijagua, 9; El General, 3; Turrialba, 1; Siquirres, 1; Miravalles, 3; La Iberia, 2; Punto Jimenez, Golfo Dulce, 1; Bonilla, 1; unspecified, 1. Panama: Guaval, Rio Calovevora, 3 (including type of *Basileuterus fulvicauda gaffneyi*). Total, 62.

PHAEOTHYLPIS LEUCOPYGIA VERAGUENSIS (Sharpe)

Basileuterus uropygialis (not of Sclater) SALVIN, Proc. Zool. Soc. London, 1867, p. 136, part (Santa Fé, Veragua; refs.); 1870, p. 183 (Bugaba, Veragua).

Basileuterus leucopygius (not of Sclater and Salvin, 1873) SALVIN and GODMAN, Biol. Centr.-Amer., Aves, vol. 1, 1881, p. 172, part (Panama localities and refs. [part]; descr.; crit.).

Basileuterus veraguensis SHARPE, Cat. Birds Brit. Mus., vol. 10, 1885, p. 403 (Bugaba, Santa Fé, Panama, and Paraiso Station [type locality], Panama; orig. descr.; type in coll. Brit. Mus.).—CHERRIE, Anal. Inst. Fis.-Geog. Nac. Costa Rica, vol. 6, 1893, p. 12 (Rio Naranjo, Costa Rica; crit.).—CHERRIE, Expl. Zool. Costa Rica, 1891-2, vol. 1, Aves, 1893, p. 14 (Buenos Aires, Costa Rica).

Basileuterus leucopygius veraguensis BANGS, Auk, vol. 18, 1901, p. 368 (Divala, Panama).—BANGS, Proc. New England Zool. Club, vol. 3, 1902, p. 60 (Boquete, Panama).

Basileuterus semicervinus veraguensis RIDGWAY, Bull. U. S. Nat. Mus., No. 50, vol. 2, 1902, p. 756, excl. syn. part (descr.; range; refs.).—BANGS, Auk, vol. 24, 1907, p. 306 (Boruca and Paso Real, Costa Rica; crit.).—CARRIKER, Ann. Carnegie Mus., vol. 6, 1910, p. 794 (Costa Rican localities and refs.; range).—STONE, Proc. Acad. Nat. Sci. Philadelphia, 1918, p. 274 (Rio Siri, Panama; habits).

Basileuterus fulvicauda toddi GRISCOM, Amer. Mus. Nov. No. 280, 1927, p. 14 (Boqueron, Chiriqui, western Panama; orig. descr.; type in coll. Amer. Mus. Nat. Hist.).

Subspecific characters.—Similar to *Phaeothlypis leucopygia leucopygia*, but under parts more buffy, less whitish, and brown shading not quite so dark.

Measurements.—Male: Wing, 62–66 (average, 64.5); tail, 50–54 (51); bill, 11–13 (12); tarsus, 21–23 (22.5). Female: Wing, 58–65 (62); tail, 47–51 (48.5); bill, 11.5–12.5 (11.8); tarsus, 22–23 (22.5).

Range.—Tropical Zone of Panama, from the Canal Zone westward along the Pacific slope to extreme southwestern Costa Rica.

Remarks.—The two races *leucopygia* and *veraguensis* may be told apart in series by the characters above specified, which seem to be the only ones to hold good. Both races vary somewhat in the color of the tail, the basal portion of which is always richer buffy in fresh plumage, but I can not find that they differ in the relative extent of this pale part, as said by Mr. Ridgway. Some examples from both Costa Rica and Panama, it is true, show a tendency for the buffy color to invade the dark area on the outer rectrices, approaching thus the condition we find in *semicervina*, but I am by no means satisfied that the one form passes into the other, and prefer to keep them distinct. Sharpe's *veraguensis* was based mainly on specimens from western Panama, but his chosen type came from Paraiso Station, on the line of the Panama Railway. Mr. Griscom, finding that three skins from the Isthmus in the old Lawrence collection (now in the American Museum of Natural History), collected by McLeannan and Galbreath (presumably at Lion Hill) were clearly referable to *semicervina*, naturally assumed that *veraguensis* was merely a synonym of that form, and he therefore proceeded to give a new name to the bird of western Panama. I can not agree to this disposition of the case. Four specimens from the Isthmus (Rio Indio, Gatun, and Rio Siri) which I have examined are indistinguishable, so far as I can see, from the common run of skins from western Panama and southwestern Costa Rica. Moreover, the type of *veraguensis* agrees perfectly with specimens from the latter locality which I sent for comparison to the British Museum, so Dr. Percy R. Lowe of that institution reports. There can be no question as to the three skins

in the Lawrence collection being *semicervina* (I had already so identified them), but either they came from some other part instead (eastern Panama?), or else both *semicervina* and *veraguensis* occur on the Isthmus. Additional field work is needed to determine this point, but in my judgment there is already enough evidence to show that *veraguensis* rests on a sufficiently sound basis. Dr. C. E. Hellmayr, who has gone over this case at my request, with Mr. Griscom's type and other material before him, agrees with this conclusion.

Mr. Griscom claims that between the bird of the Canal Zone and that of western Panama intergradation is "ecologically impossible" because of the interposition of arid country, but it would seem as if the gallery forests of this part might suffice to carry the range across.

Specimens examined.—Panama: El Banco (3,000 feet), Chiriqui, 1; Boqueron, Chiriqui, 1; Chiriqui, 1; Boquete, 3 (including type of *Basileuterus fulvicauda toddi* Griscom); Divala, 1; Cascajal, Coclé, 2; Rio Siri (20 miles S. of Gatun), 1; Rio Indio (near Gatun), 2; Gatun, 1. Costa Rica: Boruca, 20; Buenos Aires, 4. Total, 37.

PHAEOTHYLPIS SEMICERVINA SEMICERVINA (Sclater)

- Basileuterus semicrinnus* SCLATER, Proc. Zool. Soc. London, 1860, p. 84 (Nanegal, Ecuador; orig. descr.; type in coll. Brit. Mus.), p. 291 (Esmeraldas, Ecuador).—LAWRENCE, Ann. Lyc. Nat. Hist. N. Y., vol. 7, 1861, p. 322 (Panama R. R., Panama; crit.).—BAIRD, Rev. Amer. Birds, 1865, p. 243 (crit.), p. 244 (refs.).—SCLATER, Proc. Zool. Soc. London, 1865, p. 286, pl. 10, fig. 1 (refs.; diag.; range).—SCLATER and SALVIN, Proc. Zool. Soc. London, 1879, p. 494 (Remedios and Neche, Antioquia, Colombia).—SALVIN and GODMAN, Biol. Centr.-Amer., Aves, vol. 1, 1881, p. 173, in text (Santa Rita, Ecuador; range; crit.).—VON BERLEPSCH and TACZANOWSKI, Proc. Zool. Soc. London, 1883, p. 541 (Chimbo, Ecuador).—VON BERLEPSCH, Journ. f. Orn., vol. 32, 1884, p. 284 (Bucaramanga, Colombia).—TACZANOWSKI and VON BERLEPSCH, Proc. Zool. Soc. London, 1885, p. 68 (Chimbo, Ecuador).—SHARPE, Cat. Birds Brit. Mus., vol. 10, 1885, p. 404 (Nanegal, "Quito," and Santa Rita Mountains, Ecuador; "Bogotá," Colombia; descr.; refs.; crit.).—HARTERT, Nov. Zool., vol. 5, 1898, p. 480 (Cachaví, Ecuador).—SALVADORI and FESTA, Boll. Mus. Zool. ed. Anat. comp. Torino, vol. 15, No. 357, 1899, p. 9 (Foreste del Rio Peripa, Ecuador; Ecuadorian records).—GOODFELLOW, Ibis, 1901, p. 314 (Nanegal, Ecuador).
- Basileuterus uropygialis* (not of Sclater, 1861) SCLATER and SALVIN, Proc. Zool. Soc. London, 1864, p. 347 (Lion Hill, Panama; crit.).—BAIRD, Rev. Amer. Birds, 1865, p. 243 (crit.), p. 246 (Panama R. R., descr.; refs.; crit.).—TACZANOWSKI, Proc. Zool. Soc. London, 1877, p. 331 (Palma, Ecuador).—HEINE and REICHENOW, Nom. Mus. Heineani Orn., 1882, p. 14 ("Bogotá," Colombia).—SHARPE, Cat. Birds Brit. Mus., vol. 10, 1885, p. 405, part ("Bogotá" and Remedios, Colombia; crit.).
- Basileuterus leucopygius* (not of Sclater and Salvin) SALVIN and GODMAN, Biol. Centr.-Amer., Aves, vol. 1, 1881, p. 172, part (Panama R. R., crit.).
- Basileuterus semicervinus uropygialis* RIDGWAY, Bull. U. S. Nat. Mus., No. 50, vol. 2, 1902, p. 756, note ("Bogotá," Colombia; crit.).

Basileuterus fulvicauda semicervinus HELLMAYR, Abhand. K. Bayerischen Akad. Wiss., II Kl., vol. 22, 1906, p. 652, in text (crit.).—HELLMAYR, Nov. Zool., vol. 17, 1910, p. 265, part (localities in Colombia and Ecuador); Proc. Zool. Soc. London, 1911, p. 1092 (Juntas [Rio Dagua], and Rio Garrapata, Sipi, W. Colombia; Nanegal, Ecuador; refs.).—CHAPMAN, Bull. Amer. Mus. Nat. Hist., vol. 36, 1917, p. 553 (Colombian localities and refs.; W. Ecuador; crit.).—HELLMAYR, Arch. f. Naturg., vol. 85, A, 1919, p. 7, in text (range; crit.).—GRISCOM, Amer. Mus. Nov. No. 280, 1927, p. 15 (crit.).

Basileuterus fulvicauda fulvicauda (not *Muscicapa fulvicauda* Spix) CHAPMAN, Bull. Amer. Mus. Nat. Hist., vol. 36, 1917, p. 553 (Chicoral and "Bogotá," Colombia, crit.).

Basileuterus fulvicaudus semicervinus CHAPMAN, Bull. Amer. Mus. Nat. Hist., vol. 55, 1926, p. 603 (Ecuadorean localities and refs.; range).

Description.—Above olive, passing into deep neutral gray on the pileum; wings dusky, margined externally with brownish olive; upper tail-coverts and basal two-thirds of tail rich buffy (between antimony yellow and yellow ocher), the terminal portion dusky brownish, often with a greenish cast, this dark area much reduced on the outer pair of rectrices; transocular streak dusky grayish; superciliaries and sides of head rich buffy, the latter with more or less darker mottling; under parts strongly buffy, deepest on the crissum; under wing-coverts brownish buffy; "iris brown; bill black; feet brownish yellow." Juvenal plumage: dull brownish olive above and below (at least anteriorly); tail marked as in the adult.

Measurements.—Male: Wing, 61–66 (average, 64); tail, 47–53 (49); bill, 11.5–13 (12); tarsus, 21.5–23 (22.5). Female: Wing, 60–65 (63); tail, 46–49 (47); bill, 11.5; tarsus, 21.5–23 (22).

Range.—Tropical Zone, from eastern Panama southward to western Ecuador, and eastward to include the Magdalena and Cauca Valleys in Colombia.

Remarks.—No. 66,858, collection Carnegie Museum, Cordoba, Colombia, May 29, is entering on the postjuvenal moult. It is decidedly brown above, the pileum the same, and shows brown feathers on the sides of the breast.

Variation affects the depth and extent of the buffy wash below, but it averages decidedly more than in *P. fulvicauda*, as shown by the fine series examined. There is no geographical variation that I can make out, Panama skins being exactly like those from western Ecuador. Three skins from "Panama" in the Lawrence collection (now in the American Museum of Natural History) I refer here rather than to *P. leucopygia veraguensis*. These are doubtless the same that are cited by Lawrence in the reference above quoted. Either they came from the eastern part of that country, or else both *semicervina* and *veraguensis* occur in the Canal Zone, as mentioned already.

Some discussion has arisen over the status of specimens from the interior of Colombia. Sharpe ranged skins from "Bogotá" under both "*uropygialis*" (i. e., *fulvicauda*) and *semicervina*. Doctor Chapman, writing in 1917, was unable to settle the status of the Magdalena Valley form of this species because of insufficient material, but referred all his specimens from the Pacific coast and Antioquia to *semicervina*, while calling a skin from Chicoral *fulvicauda*. With a good series from El Tambor, in the valley of the Rio Lebrija, available for comparison with another from various localities in western Colombia, I find that taken as a whole the former average somewhat darker in color below than the latter, but this is fully accounted for by their less worn and fresher condition, they having been collected earlier in the season (December and January), while the other series are all in more worn plumage (April to June). They average larger, but not so decidedly as to justify subspecific separation.

It has been assumed that "Bogotá" skins (some of them at least) may have come from the low country east of the Eastern Andes, but until authentic specimens from this part actually come to hand, and turn out to be really *fulvicauda*, I see no reason to place "Bogotá" records under that form. At the same time it is possible that a recognizable form may inhabit the upper Magdalena Valley.

Specimens examined.—Ecuador: Chimbo, 2; San Javier, 1; Bucay, Guayas, 4; La Chonta (2,000 feet), Oro, 4; Esmeraldas, 6; Rio de Oro, Manavi, 5; Cebollal (3,000 feet), Loja, 1. Colombia: "Bogotá," 4; Jimenez (1,600 feet), 5; Puerto Valdivia, Antioquia, 1; Peque (5,000 feet), Antioquia, 1; Alto Bonito (1,500 feet), Antioquia, 2; Barbacoas, Nariño, 6; San José (200 feet), Cauca, 4; Novita (400 feet), Cauca, 1; Bagado (1,000 feet), Choco, 1; Juntas de Tamana (800 feet), Cauca, 2; Ricaurte (4,500 feet), Nariño, 2; Cauca, 1; Chicoral, Tolima, 1; El Tambor, Santander, 10; Soatata, 1; El Tambo, Choco, 1; Andagoya, Choco, 3; Malagita, Choco, 3; Cordoba, 4; Bitaco Valley, 1; unspecified, 8. Panama: Cerro Azul, 2; Cana, 1; "Panama Railway," 3. Total, 91.

PHAEOTHYLPIS SEMICERVINA ANNEXA, new subspecies

Type.—No. 186,071, Collection American Museum of Natural History, adult female; Pomara (1,100 feet), lower Rio Marañon, northern Peru, August 8, 1924; H. Watkins.

Subspecific characters.—Similar to *Phaeothlypisemicervinaemicervina*, but dark portion of tail more olivaceous, less brownish, and the light portion darker in tone; under parts with less buffy suffusion.

Measurements.—Male (two specimens): Wing, 63–65; tail, 50; bill, 11–12; tarsus, 20–21.5. Female (three specimens): Wing, 61–63

(average, 62); tail, 46–50 (48); bill, 11.5–12 (11.7); tarsus, 20.5–21.5 (21.2).

Range.—Valley of the Rio Marañon, Peru.

Remarks.—Although easily told from both *P. fulvicauda fulvicauda* and *P. f. poliothrix*, this form so closely resembles *P. semicervina semicervina* of western Ecuador as to be distinguishable only upon comparison of series. It has the same dark coloration above, and buffy sides of the head, but the under parts are much whiter, and the terminal part of the tail inclines more to medal bronze than to mummy brown, although there is some variation in both forms in this respect. It appears to be confined to the Marañon Valley in northwestern Peru, its characters and range thus suggesting how *semicervina* may have been derived from the cis-Andean form, *fulvicauda*, through the present race.

Specimens examined.—Peru: Huarandosa (3,000 feet), Valley Rio Chinchipe, 2; Pomara (1,100 feet), lower Rio Marañon, 3. Total, 5.

PHAEOTHYLPIS FULVICAUDA POLIOTHRIX (von Berlepsch and Stolzmann)

Basileuterus uropygialis (not of Sclater) TACZANOWSKI, Proc. Zool. Soc. London, 1874, p. 509, excl. syn. (Monterico and Amable Maria, Peru): Orn. Perou, vol. 1, 1884, p. 478, part (Monterico and Amable Maria, Peru; habits).

Basileuterus uropygialis poliothrix VON BERLEPSCH and STOLZMANN, Proc. Zool. Soc. London, 1896, p. 331 (La Gloria and La Merced, Peru; orig. descr.; type formerly in collection Warsaw Mus.); 1902, p. 60 (Chan-chamayo, Peru).

Basileuterus fulvicauda poliothrix HELLMAYR, Abhand. K. Bayerischen Akad. Wiss., II Kl., vol. 22, 1906, p. 653, in text (crit.); Nov. Zool., vol. 17, 1910, p. 265, in text (ref. orig. descr.; crit.); Arch. f. Naturg., vol. 85, A, 1919, p. 7, in text (Chan-chamayo, Peru; crit.).

Subspecific characters.—Similar to *Phaeothlypis fulvicauda fulvicauda*, but upper parts more olivaceous, less brownish in tone; upper tail-coverts and basal part of tail paler buffy; sides of head, and flanks and crissum also paler buffy; and terminal band of tail more greenish, less brownish.

Measurements.—Male (four specimens): Wing, 64–68 (average, 66); tail, 50–53 (51.5); bill, 11–11.5 (11.2); tarsus, 21–22 (21.4). Female (one specimen): Wing, 63; tail, 50; bill, 11; tarsus, 21.

Range.—Tropical Zone, central to southeastern Peru.

Remarks.—The gray crown and nape were supposed by the describer to be the chief character of this form, but I do not see that there is any difference of moment in this respect. The type I have not seen, but a specimen from Perené, Junin, Peru, ought on geographical grounds to represent the form, and the other skins from southeastern Peru agree with it sufficiently well, and differ from

specimens from eastern Ecuador and the upper Amazon as above said. The color of the upper parts is close to olive green, and the tail is near dark citrine on its terminal portion, and apricot yellow basally.

Although Doctor Hellmayr has expressed doubt regarding the validity of this race, it impresses me as a good form, judging from the few specimens examined. This authority refers an example from Yahuarmayo, Peru, to true *fulvicauda*, but all the skins I have seen from southeastern Peru are certainly not that form.

Specimens examined.—Peru: Rio Tavara (1,600 feet), 2; La Pampa, 2; Astillero, 1; Perené (2,000 feet), Junin, 1. Total, 6.

PHAEOTHYLPIS FULVICAUDA FULVICAUDA (Spix)

Muscicapa fulvicauda SPIX, Avium Species Novae, etc., vol. 2, 1825, p. 20, pl. 28, fig. 2 (Brazil [no locality specified]: orig. descr.; type in coll. Munich Museum).

Basileuterus uropygialis SCLATER, Proc. Zool. Soc. London, 1861, p. 128 ("Brazil"; orig. descr.; type now in coll. Brit. Mus.); Cat. Amer. Birds, 1861, p. 35 ("Brazil"; ref. orig. descr.).—SCLATER, Proc. Zool. Soc. London, 1864, p. 167, in text (crit.); 1865, p. 286, excl. syn. part, pl. 10, fig. 2 ("Panama" [error]; refs.: diag.).—SCLATER and SALVIN, Proc. Zool. Soc. London, 1867, pp. 749, 754 (Chayavetas, Peru); 1873, p. 257 (Chayavetas and Santa Cruz, Peru).—SALVIN and GODMAN, Biol. Centr.-Amer., Aves, vol. 1, 1881, p. 173, in text (range; crit.).—TACZANOWSKI, Proc. Zool. Soc. London, 1882, p. 6 (Huambo, Peru); Orn. Perou, vol. 1, 1884, p. 478, part, Tables, p. 29, part (Chayavetas, Santa Cruz and Huambo, Peru: descr.; refs.).—SHARPE, Cat. Birds Brit. Mus., vol. 10, 1885, p. 405, part (Sarayacu, Ecuador; Santa Cruz and Chayavetas, Peru: descr.; refs.: crit.).—VON BERLEPSCH and STOLZMANN, Proc. Zool. Soc. London, 1896, p. 331, note (crit.), p. 332 (Huambo, Peru, and E. Ecuador).—SALVADORI and FESTA, Boll. Mus. Zool. ed Anat. comp. Torino, vol. 15, No. 357, 1899, p. 9 (Valle del Zamora, Ecuador; Ecuadorean refs.; crit.).

Basileuterus fulvicauda HELLMAYR, Abhand. K. Bayerischen Akad. Wiss., II KL, vol. 22, 1906, p. 652 (crit. on type: Sarayacu, Ecuador).

Basileuterus fulvicauda semicervinus (not of Sclater) HELLMAYR, Nov. Zool., vol. 17, 1910, p. 265, part (Calama, Rio Madeira; range; crit.). (?) *Basileuterus fulvicauda fulvicauda* HELLMAYR, Arch. f. Naturg., vol. 85, A, 1919, p. 7 (Yahuarmayo, Peru; range, crit.).

Basileuterus fulvicauda fulvicaudus CHAPMAN, Bull. Amer. Mus. Nat. Hist., vol. 55, 1926, p. 603 (Zamora, Rio Suno, and below San José, Ecuador; crit.).

Description.—Pileum dull neutral gray, passing into olive on the rest of the upper parts; wings externally similar to the back, but more brownish; basal half or more of the tail (with the upper coverts) deep buff, the terminal part deep buffy olive or dull medal bronze; short superciliaries buffy; lores and postocular spot dusky; sides of the head more or less buffy; below white, washed with buffy, particularly on the breast, sides, and crissum, the latter nearly

matching the basal part of the tail; bill brownish; tarsi and feet pale (in skin).

Juvenal plumage (No. 44,339, Collection Field Museum of Natural History; Moyobamba, Peru, July 18): above, including pileum, dull dark brown (near sepia); wings and tail as in the adult, but upper tail-coverts more rusty buff; throat and breast Saccardo's umber, passing into dull buffy posteriorly.

Measurements.—Male: Wing, 61–67 (average, 64.5); tail, 46–54 (50); bill, 11–12 (11.5); tarsus, 20–22 (21.2). Female: Wing, 58–67 (61.65); tail, 47–51 (49); bill, 10.5–12 (11.2); tarsus, 19.5–21.5 (20.5.).

Range.—From eastern Ecuador and northeastern Peru eastward (south of the Amazon) to the Rio Madeira.

Remarks.—Most of the references to this species in the literature appear under Sclater's name *uropygialis*, applied in 1861 to a bird supposed to have come from Brazil. Later on Sclater examined some specimens from Panama which he thought were the same, and altered the type locality accordingly. But it appears as if the original designation were correct, if we understand by "Brazil" the upper Amazon. Most of the records, it is true, come from beyond the limits of that country, in eastern Ecuador and Peru. The late Count von Berlepsch was the first to suspect that the *Muscicapa fulvicauda* of Spix was an earlier name for the same species, and his suspicions were confirmed by Doctor Hellmayr's examination of the type in the Munich Museum. Spix's figure is far from good, not showing the buffy superciliaries at all, but is easily recognizable by reason of the characteristic color pattern of the tail. He specifies no particular locality for his type, but it must have come from some point on the Rio Solimoës, and in order to get a definite basis for the nomenclature I propose to fix São Paulo de Olivença as the type locality, on the strength of specimens from this place in the collection of the Carnegie Museum, and of the circumstance that Spix is known to have collected here. A small series from the Rio Purús are not different, and specimens from eastern Ecuador are also the same. Four skins from Moyobamba, Peru, are clearly referable here, and on this account I place all the records for this part of Peru under the present heading. Doctor Hellmayr refers a single skin from Calama, Rio Madeira, to *semicervina*, although indicating certain differences between it and specimens of that form from western Ecuador. These are all confirmed by our series, which are readily distinguishable from Colombian birds by their whiter under parts and more extensive and more greenish dark tipping of the rectrices, with the colored part less sharply defined.

The record of this form from Yahuarimayo, southeastern Peru, requires confirmation, since all the skins from that region seen

by me belong clearly to *poliothrix*. "Bogotá" records are all placed under *semicervina*, since there is nothing as yet to show that true *fulvicauda* extends to eastern Colombia.

Specimens examined.—Brazil: Hyutanahan, Rio Purús, 8; São Paulo de Olivença, 3. Ecuador: Below San José de Sumaco, 4; Lower Rio Suno, 5; Zamora, Loja, 1. Peru: Moyobamba, 4. Total, 25.

Genus *BASILEUTERUS* Cabanis

Basileuterus CABANIS, Arch. f. Naturg., vol. 13, pt. 1, 1847, p. 316 (nomen nudum).—CABANIS, in Schomburgk, Reisen in Britisch-Guiana, vol. 3, 1848, p. 666 (diag.; type, by monotypy, "*Basileuterus vermivorus* Cabanis"=*Basileuterus auricapillus olivascens* Chapman).—CABANIS and HEINE, Mus. Heineanum, vol. 1, 1850, p. 17 (two species given).—BONAPARTE, Conspectus Avium, vol. 1, 1850, p. 313, part (ten species).—GRAY, List Gen. Birds, 1855, p. 53 (in list).—BURMEISTER, Syst. Ueber. Thiere Brasiliens, vol. 3, 1856, p. 112 (diag.).—BAIRD, Rept. Pacific R. R. Surv., vol. 9, 1858, p. 296 (diag.; crit.); Rev. Amer. Birds, 1865, p. 241, part (diag.; crit.; list of species, etc.).—SCLATER, Proc. Zool. Soc. London, 1865, p. 282, part (crit.; list of 15 species).—GRAY, Hand-List Birds, vol. 1, 1869, p. 244, part (subgenus under *Setophaga*; list of species).—SCLATER and SALVIN, Nom. Avium Neotrop., 1873, p. 10, part (22 species).—GIEBEL, Thes. Orn., vol. 1, 1877, p. 458, part (list of species).—SALVIN and GODMAN, Biol. Centr.-Amer., vol. 1, 1881, p. 169, part (crit.; range; Middle American forms).—SHARPE, Cat. Birds Brit. Mus., vol. 10, 1885, p. 376, part (monogr.; 35 forms treated).—WATERHOUSE, Index Gen. Avium, 1889, p. 19 (ref. orig. diag.).—DUBOIS, Syn. Avium, vol. 1, 1901, p. 438, part (26 species and 13 "varieties").—RIDGWAY, Bull. U. S. Nat. Mus., No. 50, vol. 2, 1902, p. 738, part (diag.; range; crit.; Mid. Amer. forms).—ALLEN, Bull. Amer. Mus. Nat. Hist., vol. 23, 1907, p. 372, and 24, 1908, p. 15 (type).—SHARPE, Hand-List Birds, vol. 5, 1909, p. 123, part (list of 46 forms), p. 638 (3 forms).—BRABOURNE and CHUBB, Birds S. Amer., vol. 1, 1912, p. 358, part (list of 30 S. Amer. forms).—CHUBB, Birds Brit. Guiana, vol. 2, 1921, p. 416 (diag.).

Generic characters.—Bill variable, but moderate, rounded, about as deep as wide at the nostrils (decidedly wider only in *B. mesoleucus*, *B. bolivianus*, and *B. fraseri*), with the culmen distinctly ridged, and the vertical outlines gently curved. Rictal bristles well developed, but not reaching beyond the tip of the bill. Wings rounded, with a short wing-tip, the ninth (outermost) primary usually shorter than the third. Tail shorter than the wing, but longer than the distance from the bend of the wing to the tip of the secondaries, more or less rounded. Tarsus not less than one-third as long as the wing, the feet not reaching when outstretched beyond the tip of the tail, and longer than the middle toe and claw. Coloration various, but wings always plain, and tail uniform; under parts variously yellow or white, and pileum sometimes plain, but often with two lateral stripes of black inclosing a median vertical stripe or spot of brighter color; no buffy on rump or tail basally.

Remarks.—*Basileuterus* as a group is clearly of South American origin, but now has a wide range, both latitudinally and altitudinally. As here restricted it ranges from Uruguay and Argentina northward through Central America to tropical Mexico, but avoids the great Amazonian forest region, only one species invading its eastern edge. Of the 32 species herein recognized 13 belong to the Tropical and 15 to the Subtropical Zone, while only 4 are found in the Temperate Zone. With a few exceptions the derivation of these Subtropical Zone forms is obscure; they are in the main not zonal representatives, but rather distinct or even isolated species, although a number of them have become split up into geographical races.

The three-striped pileum, which is found in so many species of this group, is a feature found also in other genera of this family (*Helmitheros*, *Seiurus*), and is probably without especial significance as indicative of affinity. Aside from the genera treated in the present paper, *Basileuterus* probably finds its nearest relative in *Myioborus*.

KEY TO THE SPECIES OF BASILEUTERUS

- A.¹ Pileum dull or dark gray, without a differently colored coronal stripe or spot.
 - b.¹ Under parts whitish or buffy.
 - c.¹ Superciliaries and cheeks more or less buffy.
 - d.¹ Pileum with no definite dark lateral stripe.
 - e.¹ Superciliaries and cheeks bright buffy (cinnamon buff).
Basileuterus mesoleucus.
 - e.² Superciliaries and cheeks pale buffy (pinkish buff).
Basileuterus bolivianus.
 - d.² Pileum with a definite dark lateral stripe.
Basileuterus rivularis.
 - c.² Superciliaries and cheeks whitish or grayish.
 - d.¹ Pileum uniform gray; superciliaries white.
Basileuterus leucophrys.
 - d.² Pileum gray medially, black laterally; superciliaries gray.
Basileuterus leucoblepharides.
 - b.² Under parts yellow-----*Basileuterus griseiceps.*
- A.² Pileum not gray or rufous, or if gray then with a conspicuous coronal spot or stripe of a different color.
 - b.¹ Broad superciliaries and sides of the head in general slaty gray.
 - c.¹ Abdomen white-----*Basileuterus castaneiceps.*
 - c.² Abdomen yellow.
 - d.¹ Throat grayish.
 - e.¹ Coronal spot brownish orange-----*Basileuterus coronatus.*
 - e.² Coronal spot bright yellow.
 - f.¹ Breast grayish like the throat.
Basileuterus cinereicollis.
 - f.² Breast yellow like the abdomen.
Basileuterus conspicillatus.
 - d.² Throat yellow like the rest of the under parts.
Basileuterus fraseri.

- b.² Superciliaries and sides of the head in general not slaty gray.
- c.¹ Pileum plain olive greenish, unstriped, uniform with the rest of the upper parts.
- d.¹ Superciliaries and under parts bright yellow.
- e.¹ Upper parts brighter (bright warbler green).
Basileuterus flaveolus.
- e.² Upper parts duller (more olive green).
- f.¹ Smaller; wing of male averaging less than 65 mm.
Basileuterus signatus.
- f.² Larger; wing of male averaging more than 65 mm.
Basileuterus lateoviridis.
- d.² Superciliaries buffy; under parts wax yellow, with darker shading-----*Basileuterus richardsoni.*
- c.² Pileum with conspicuous black lateral stripes and a median coronal stripe of some other color.
- d.¹ Sides of the throat greenish, yellowish, or grayish.
- e.¹ Wings, tail, and upper parts in general decidedly olive greenish (but compare "e.²").
- f.¹ Supraloral stripe and subauricular spot yellow, in contrast with the dull green sides of the head.
- g.¹ Above more greenish; bill black.
- h.¹ Larger; wing of male averaging 68 mm.; tail 60.5 mm.-----*Basileuterus bivittatus.*
- h.² Smaller; wing of male averaging 63.5 mm.; tail 54 mm. or less.
Basileuterus chrysogaster.
- g.² Above more brownish; bill horn brown.
Basileuterus roraimae.
- f.² Supraloral stripe and subauricular spot (if present) not yellow.
- g.¹ Coronal stripe dull yellowish or buffy.
- h.¹ Throat yellow or buffy, like the rest of the under parts.
- i.¹ Auriculars only partly black.
- j.¹ Superciliaries more olive greenish, like the back; under parts more olive yellow-----*Basileuterus tacarcunae.*
- j.² Superciliaries more buffy, like the under parts.
Basileuterus meridanus.
- i.² Auriculars wholly black.
Basileuterus tristriatus.
- h.² Throat buffy, different from the yellow of the rest of the under parts.
Basileuterus trifasciatus.
- g.² Coronal spot conspicuous, Mars yellow to orange rufous.
- h.¹ Under parts white-----*Basileuterus hypoleucus.*
- h.² Under parts bright yellow.
Basileuterus auricapillus.

- e.² Wings, tail, and upper parts in general more grayish (yellowish olive only in *Basileuterus culicivorus godmani*).
- f.¹ Superciliaries, sides of the head, etc., more grayish. *Basileuterus cabanisi*.
- f.² Superciliaries, sides of the head, etc., more yellowish. *Basileuterus culicivorus*.
- d.² Sides of the throat black, continuous with the auriculars. *Basileuterus basilicus*.
- A.³ Pileum rufous or chestnut, with conspicuous superciliaries, but no median coronal stripe.
- b.¹ Pileum chestnut, with a narrow lateral line black.
 - c.¹ Sides of head black to greenish dusky.
 - d.¹ Superciliaries straw yellow----- *Basileuterus ignotus*.
 - d.² Superciliaries white.
 - e.¹ Above darker (olivaceous black)---- *Basileuterus bensoni*.
 - e.² Above lighter (brownish olive)-- *Basileuterus melanogenys*.
 - c.² Sides of the head chestnut, like the pileum----- *Basileuterus belli*.
 - b.³ Pileum plain rufous, without a narrow black lateral line. *Basileuterus delatirii*.

BASILEUTERUS MESOLEUCUS Sclater

Basileuterus mesoleucus SCLATER, Proc. Zool. Soc. London, 1865, p. 286, pl. 9, fig. 1 (Demerara, British Guiana; orig. descr.; type in coll. Brit. Mus.).—SHARPE, Cat. Birds Brit. Mus., vol. 10, 1885, p. 402 (Demerara and Kama-kusa, British Guiana; descr.; refs.).—SALVIN, Ibis, 1885, p. 203 (Kama-kusa, British Guiana); 1886, p. 506 (range).—VON BERLEPSCH and HARTERT, Nov. Zool., vol. 9, 1902, p. 11 (Suapure, Venezuela).—MÉNÉGAUX, Bull. Mus. d'Hist. Nat., 1907, p. 496 (French Guiana; crit.).—VON BERLEPSCH, Nov. Zool., vol. 15, 1908, p. 108 (Approuage and Ipousin, French Guiana; Rio Carimang, British Guiana; Pará, Brazil).—PENARD, Vogels van Guyana, vol. 2, 1910, p. 489 (Brit. Guiana; descr., etc.).—SNETHLAGE, Bol. Mus. Goeldi, vol. 8, 1914, p. 483 (Pará, Peixe-Boi, and Santo Antonio do Prata, Brazil; descr.).—CHUBB, Birds Brit. Guiana, vol. 2, 1921, p. 418 (British Guiana localities and refs.; descr.).

Basileuterus rivularis mesoleucus HELLMAYR, Abhand. K. Bayerischen Akad. Wiss., Math.-phys. Kl., vol. 26, 1912, p. 86 (Santo Antonio do Prata, Brazil).

Description.—Pileum iron gray, passing into dull dark citrine on the upper parts, the rump and upper tail-coverts a little brighter; wings and tail externally like the back; short superciliaries and subocular region ochraceous tawny, and auricular region tinged with the same color; transocular stripe iron gray; underparts white, more or less washed with buffy, especially on the breast, sides, and crissum; under wing-coverts old gold; "iris gray, feet light yellow-orange, bill white and black" (Klages).

Some few specimens show traces of deep rusty margins to the wing-coverts—probably an indication of immaturity. Young birds in juvenal dress (Tumatumari, British Guiana, July 25 and August 5) resemble the adults, but are much duller and browner above, with

the pileum like the back, the buffy sides of the head merely indicated; the throat and breast are also dull brownish.

Measurements.—Male: Wing, 59–64 (average, 62.5); tail, 52–56 (55); bill, 12–13 (12.5); tarsus, 21.5–23 (22.5). Female: Wing, 58–62 (60); tail, 49–55 (52.5); bill, 11–12 (11.5); tarsus, 20–22 (21).

Range.—From eastern Venezuela (Rio Caura) through the Guianas to northern Brazil (Rio Branco, Rio Tapajoz, and the Pará region).

Remarks.—This species appears to be very imperfectly known, few specimens, indeed, being extant outside of the series of 26 skins in the Carnegie Museum. It was described by Sclater from a single specimen collected in British Guiana, and has since been traced westward to the Orinoco Delta and the Caura River in Venezuela, and southward through French Guiana to the Pará district of Brazil, on the south bank of the Amazon. More recently Messrs. Anderson and Becker have sent specimens to the Field Museum from the Rio Branco, while Mr. Klages secured a good series in French Guiana, and a few also from the Rio Tapajoz. He writes that it is “found in pairs, generally about the borders of the forest in the heavily timbered and hilly interior, but is not very numerous.” On the label of the specimen from the Manimo River, Orinoco Delta, it is called a “water thrush.” On the score of coloration alone, the species appears to be related on the one hand to the members of the genus *Phaeothlypis*, and on the other to the more typical *Basileuteri* through *B. bolivianus* and *B. rivularis*. Several individuals, indeed, show traces of a buffy median vertical stripe developed on the forehead. The gray of the pileum varies somewhat according to season, and may average a little duller in females.

Specimens examined.—Venezuela: Isla de Morocotico, Manimo River, 1. British Guiana: Mannehaha Creek, 18 miles up Potaro Road, 3; Rockstone, Essequibo River, 1; Tumatumari, Potaro River, 2. French Guiana: Tamanoir, 11; Pied Saut, 11. Brazil: Serra Granda, Rio Branco, 1; Serra da Lua, Boa Vista, 1; Conceicao, Rio Branco, 1; Benevides, 1; Colonia do Mojuy, 2; Villa Braga, 1. Unspecified, 2. Total, 37.

BASILEUTERUS BOLIVIANUS Sharpe

Basileuterus mesoleucus (not of Sclater, 1865) SCLATER and SALVIN, Proc. Zool. Soc. London, 1879, p. 594 (Yuyo, Bolivia).

Basileuterus bolivianus SHARPE, Cat. Birds Brit. Mus., vol. 10, 1885, p. 402 (Yuyo, Bolivia, orig. descr.; type in coll. Brit. Mus.).

Description.—Pileum deep neutral gray, passing into olive citrine on the back, and this brightening into buffy citrine or old gold on the upper tail-coverts; tail similar but duller; wings dusky, with dark citrine outer margins, very narrow on the primaries; short

superciliaries and subocular spot light buff, separated from each other by a grayish transocular stripe; chin and sides of the head tinged with buffy; under parts white, more or less washed with light buff, especially on the breast, sides, and crissum; under wing-coverts washed with citrine; "iris brown; bill black; feet light yellowish brown."

Measurements.—Male (six specimens): Wing, 65–70 (average, 67); tail, 51–57 (53); bill, 11–13 (12); tarsus, 20.5–22.5 (21). Female (seven specimens): Wing, 62–68 (65); tail, 50–54 (52); bill, 11–12 (11.5); tarsus, 21–21.5 (21).

Range.—Eastern foothills of the Andes, Bolivia.

Remarks.—This species greatly resembles *B. mesoleucus*, but the upper parts are duller olive green; the pileum is paler gray; the superciliaries and sides of the head are much paler buffy, without any rufescent shade; the under parts, too, have less buffy wash; the wing is longer in proportion; and the bill is slenderer. These differences impress one as being of specific value upon comparison, while the known range of the present form is widely separated from that of *B. mesoleucus*, affording no chance for intergradation. If anything, *B. bolivianus* is rather nearer in its characters to *B. rivularis*.

The characters assigned by Sharpe in his description do not fit the present series at all, and there is naturally some question as to the pertinence of his name. I assume that the "rufescent throat" to which he refers denotes immaturity. The "absence of rufous edgings to the wing-coverts" is of no significance, at any rate. There is of course the possibility that the birds from the Santa Cruz region of Bolivia may not be the same as those from the La Paz district, in which case the former would require a new name. Comparison with topotypical material is most desirable, but meanwhile it may be well to accept the name *bolivianus* on the basis above indicated.

Specimens examined.—Bolivia: Juntas, 1; Tres Arroyas, Rio Espirito Santo, 1; Rio Surutu, 1; Rio Yapacani, 1; Cerro del Ambero, 1; Cerro Hosane, 7; Vermejo (3,500 feet), Santa Cruz, 2. Total, 14.

BASILEUTERUS RIVULARIS (Wied)

Muscicapa rivularis WIED, Reise nach Brasilien, vol. 2, 1821, p. 103 (Rio Belmonte, Bahia, Brazil; orig. descr.; types in coll. Amer. Mus. Nat. Hist.); Beiträge Naturg. Brasilien, vol. 3, pt. 2, 1831, p. 789, excl. Vieillot ref. (Rio Belmonte and Rio Ilhéos, Bahia, Brazil; descr.; habits).

Muscicapa stragulata LICHTENSTEIN, Verz. Doubl., 1823, p. 55 (São Paulo, Brazil; orig. descr.; type in Berlin Mus.).

Geothlypis stragulata CABANIS and HEINE, Mus. Heineanum, pt. 1, 1850, p. 17 (Bahia, Brazil; ref. orig. descr.).—EULER, Journ. f. Orn., vol. 16, 1868, p. 191 (Cantagallo, Brazil; descr. nest and eggs).—CABANIS, Journ. f. Orn., vol. 22, 1874, p. 82 (Cantagallo, Brazil; crit.).

Trichas stragulata BURMEISTER, Syst. Ueber. Thiere Brasilens, vol. 3, 1856, p. 115 (Prov. São Paulo, Brazil; descr.; refs.).

Basileuterus stragulatus SCLATER, Cat. Amer. Birds, 1861, p. 35 (Brazil; refs.).—BAIRD, Rev. Amer. Birds, 1865, p. 243 (diag.), p. 244 (refs.).—SCLATER, Proc. Zool. Soc. London, 1865, p. 285 (refs.; diag.; range).—VON PELZELN, Orn. Brasilens, pt. 2, 1868, p. 72 (Registo do Sai, Taipa, Ypanema, Paranaqua, Ytararé, and Rio Paraná, Brazil).—REINHARDT, Vidensk. Med. Nat. For. Kjobenhavn, 1870, p. 444 (Minas Geraës and Neu Freiburg, Brazil; von PELZELN's record).—VON BERLEPSCH, Journ. f. Orn., vol. 21, 1873, p. 232 (Blumenau, Santa Catharina, Brazil; refs.; range).—HEINE and REICHENOW, Nom. Mus. Heineani Orn., 1882, p. 14 (Bahia, Brazil).—SHARPE, Cat. Birds Brit. Mus., vol. 10, 1885, p. 401 (São Paulo and Lagos dos Patos, Brazil; descr.; refs.).—ALLEN, Bull. Amer. Mus. Nat. Hist., vol. 2, 1889, p. 215 (crit. on Wied's type).—KOENIGSWALD, Journ. f. Orn., vol. 44, 1896, p. 346 (Estado do São Paulo, Brazil; refs.).—VON IHERING, Rev. Mus. Paulista, vol. 3, 1899, p. 135 (Iguape, São Paulo, Brazil; Brazilian records); vol. 4, 1900, p. 152 (Cantagallo and Novo Friburgo, Brazil), p. 203 (Euler's record).—EULER, Rev. Mus. Paulista, vol. 4, 1900, p. 14 (descr. nest and eggs).—VON IHERING, Aves do Brazil, 1907, p. 334 (Iguape, Baurú, Alto da Serra, Ubatuba, Itararé, and Ourinho, Brazil; range).—(?) BERTONI, Fauna Paraguaya, 1913, p. 60 (Puerto Bertoni and Iguasú, Paraguay).—RIDGWAY, Bull. U. S. Nat. Mus., No. 50, vol. 2, 1902, p. 740, in text (crit.).

Siphia obscura (!) SHARPE, Proc. Zool. Soc. London, 1881, p. 789 ("Borneo"; orig. descr.; type in coll. Brit. Mus.).

Basileuterus rivularis (EDITOR), Bull. Brit. Orn. Club., vol. 41, 1920, p. 35 (syn.).

Description.—Above dull dark citrine, passing into orange citrine on the rump and upper tail-coverts; wings externally like the back; tail similar but somewhat lighter in tone; pileum dark olive gray medially, with lateral stripes brownish black, not very well defined, indistinctly spreading out and tending to meet on the nape; narrow superciliaries pale buffy; transocular stripe brownish black; auriculars mottled buffy and dusky; under surface white, strongly shaded with buffy on the sides, crissum, and breast; under wing-coverts old gold; feet pale (in skin).

Some examples have a partially concealed buffy spot on the forehead.

Measurements.—Seven specimens (not sexed): Wing, 62–65 (average, 63.5); tail, 53–59 (56); bill, 12.5–13 (13); tarsus, 23–25 (23.5).

Range.—Eastern Brazil, from Bahia south to Rio Grande do Sul (and west to Paraguay?).

Remarks.—In its general coloration and proportions *Basileuterus rivularis* resembles *B. mesoleucus*, while in its pale and inconspicuous

superciliaries it is more like *B. bolivianus*. It differs from both in having the gray of the pileum with a broad dark lateral border, and is unquestionably specifically distinct. Although Wied described this bird in 1821, his types being still extant in the American Museum of Natural History, his name has until very recently been passed over in favor of Lichtenstein's later appellation of *stragulatus*, possibly because he (Wied) fails to mention the distinctive character of the lateral crown-stripes, or else because it was supposed his description did not appear until 1831. He is the only author to give an extended account of its habits, as observed in the southern part of the State of Bahia. Later authors have met with it as far south as Rio Grande do Sul. The Paraguay record by Bertoni, above cited, requires confirmation. Nowhere, so far as known, does its range meet that of *B. mesoleucus*, being strictly confined to the coast States of Brazil from Bahia southward. It has the habits of a water thrush, betraying thus its affinity to the members of the genus *Phaeothlypis*.

Specimens examined.—"Bahia," 4; Fazenda Cayoa, 1; unspecified, 5 (including types of species). Total, 10.

BASILEUTERUS LEUCOPHRYS von Pelzeln

Basileuterus leucophrys VON PELZELN, Orn. Brasiliens, pt. 1, 1868, p. 72 (Porto do Rio Paraná and Rio Manso, Brazil), p. 137 (orig. descr.; type in coll. Vienna Mus.).—SHARPE, Cat. Birds Brit. Mus., vol. 10, 1885; p. 400 (descr., ex von Pelzeln).—ALLEN, Bull. Amer. Mus. Nat. Hist., vol. 3, 1891, p. 345 (Chapada, Matto Grosso, Brazil).—VON IHERING, Proc. Zool. Soc. London, 1899, p. 510 (Estado de São Paulo, Brazil); Aves do Brazil, 1907, p. 334 (range).—BERTONI, Fauna Paraguaya, 1913, p. 60 (Brazilian localities).—HELLMAYR, Nov. Zool., vol. 28, 1921, p. 244, in text (crit.).

Description.—Pileum dark neutral gray, illy defined posteriorly, and with a faintly indicated paler median frontal stripe; superciliaries white; transocular stripe dark neutral gray like the crown; back and wing-coverts dull dark citrine; wings and tail similar but browner (near medal bronze); sides of neck deep neutral gray; cheeks and under parts white, more or less mottled or clouded with neutral gray; tibiae grayish olive, and flanks shaded with the same color; crissum cream buff; edge of wing amber yellow, under wing-coverts dull yellowish white; "bill black; feet dusky yellow" (Cherrie).

Measurements.—Male (one specimen): Wing, 71; tail, 65; bill, 12; tarsus, 24. Female (three specimens): Wing, 68–70 (average, 69); tail, 65–68 (67); bill, 12–13 (12.7); tarsus, 23.

Range.—From northwestern Matto Grosso south and east to northern São Paulo, Brazil.

Remarks.—A near relative of *B. leucoblepharides*, but larger, color of upper parts much more brownish in tone; no distinct dark lateral

crown-stripe, but a broad white superciliary stripe; the cheeks, too, are white, not gray, and the flanks are pale brownish. The under parts are about the same in both, the throat and middle of the abdomen alone being free from dark mottling.

Of this rare species only a very few specimens are known; three in the Vienna Museum (the type series) and four in the American Museum of Natural History, from Chapada and Aldeia Queimada, Matto Grosso, those from the last-named locality having been collected in 1914 by Mr. George K. Cherrie, but not previously recorded. I have been unable to discover on whose authority von Ihering gives it from Goyaz, although it may occur there, as it appears to favor the campos region in general.

Specimens examined.—Aldeia, Queimada, Matto Grosso, 2; Chapada, Matto Grosso, 2. Total, 4.

BASILEUTERUS LEUCOBLEPHARIDES (Vieillot)

"El Contramaestre" AZARA, Apuntamientos, vol. 2, 1802, p. 40 (Paraguay; descr.; habits, etc.).

"Le Contre-maitre" AZARA, Voy. Amer. Mérid., vol. 3, 1809, p. 332 (translation of original account).

Sylvia leucoblepharides VIEILLOT, Nouv. Dict. d'Hist. Nat., vol. 11, 1817, p. 206 ([Paraguay, ex Azara]; orig. descr.; habits, etc.).

Sylvia leucoblephara VIEILLOT, Enc. Méth., vol. 2, 1823, p. 459 (Paraguay, ex Azara; descr.).—D'ORBIGNY and LAFRESNAYE, Mag. Zool., 1837, Syn. Avium, p. 20 (Corrientes, Argentina).—D'ORBIGNY, Voy. Amer. Mérid., 1844, p. 216, pl. 12, fig. 2 (Corrientes, Argentina; descr.; refs.; habits).

Trichas superciliosus SWAINSON, Anm. in Menag., 1838, p. 295 ("Brazil;" orig. descr.; type ———).

Trichas leucoblephara LAFRESNAYE, Rev. Zool., 1840, p. 230 (refs.).—HARTLAUB, Index Azara, 1847, p. 10 (Azara's and Swainson's refs.).—BONAPARTE, Consp. Avium, vol. 1, 1850, p. 310 (diag.; syn.; range).—BURMEISTER, Syst. Ueber. Thiere Brasiliens, vol. 3, 1856, p. 114 (Neu Freiburg, Brazil; descr.; refs.; habits).

Geothlypis leucoblephara CABANIS and HEINE, Mus. Heineanum, vol. 1, 1850, p. 17 (Brazil; refs.).

Basileuterus leucoblepharus SCLATER, Proc. Zool. Soc. London, 1865, p. 285 (refs.; diag.; range).—VON PELZELN, Orn. Brasiliens, pt. 1, 1868, p. 72 (Ypanema and Curytiba, Brazil; habits; crit.).—SHARPE, Cat. Birds Brit. Mus., vol. 10, 1885, p. 400 (Pelotas, Rio Grande do Sul, Brazil; descr.; refs.).—VON BERLEPSCH and VON IHERING, Zeits. Ges. Orn., vol. 2, 1885, p. 115 (Picada Tocana, Arroio Grande, and Novo Friburgo, Rio Grande do Sul, Brazil; crit.).—VON BERLEPSCH, Journ. f. Orn., vol. 35, 1887, p. 114 (Paraguay, ex Azara and Page; crit.).—GOELDI, Aves do Brazil, 1894, p. 269 (range in Brazil), p. 271 (Organ Mountains, Brazil).—KOENIGSWALD, Journ. f. Orn., vol. 44, 1896, p. 346 (Estado de São Paulo, Brazil; refs.).—VON IHERING, Rev. Mus. Paulista, vol. 3, 1899, p. 135 (Ypiranga, São Paulo, Brazil; Brazilian records); vol. 4, 1900, p. 152 (Novo Friburgo, Brazil), p. 203 (Itatiba, Brazil; descr. nest and eggs); Aves do Brazil, 1907, p. 333 (Ypiranga, Campos do Jordão, Campinas, Itararé, and Itatiaya, Brazil; Ancones, Argentina; range).—LÜDER-

- WALDT, Zool. Jahrb., vol. 27, 1909, p. 356 (Campo Itatiaya, Brazil).—DABBENE, An. Mus. Nac. Buenos Aires, ser. 3, vol. 11, 1910, p. 369 (Argentina localities).—CHUBB, Ibis, 1910, p. 615 (Sapucay, Paraguay; refs., habits).—BERTONI, An. Soc. Cient. Argentina, vol. 75, 1913, p. 97 (Chaco and Misiones, Argentina).—DABBENE, Bol. Soc. Physis, vol. 1, 1914, p. 354 (Argentina records and refs.).—LYNCH-ARRIBALZAGA, El Hornero, vol. 2, 1920, p. 97 (Argentine Chaco).—RIBEIRO, Arch. Mus. Nac. Rio de Janeiro, vol. 24, 1923, p. 254 (Itatiaya, Brazil).—HOLT, Bull. Amer. Mus. Nat. Hist., vol. 57, 1928, p. 314 (Serra do Itatiaya, Brazil; local range; habits).
- Basileuterus leucoblepharum* BAIRD, Rev. Amer. Birds, 1865, p. 242 (diag., crit.), p. 244 (refs.; range).
- Basileuterus superciliosus* BAIRD, Rev. Amer. Birds, 1865, p. 243 (diag., crit.), p. 244 (refs.; range).—VON BERLEPSCH, Journ. f. Orn., vol. 35, 1887, p. 114, note (crit.).—SHARPE, Hand-List Birds, vol. 5, 1909, p. 127 (in list of species; range; crit.).
- Basileuterus leucoblepharus calus* OBERHOLSER, Proc. Biol. Soc. Washington, vol. 14, 1901, p. 188 (Sapucay, Paraguay; orig. descr.; type in coll. U. S. Nat. Mus.); Proc. U. S. Nat. Mus., vol. 25, 1902, p. 141 (Sapucay, Paraguay; descr.; crit.).—BERTONI, Fauna Paraguaya, 1913, p. 60 (Alto Paraná, Paraguay).
- Basileuterus leucoblepharus leucoblepharus* HARTERT and VENTURI, Nov. Zool., vol. 16, 1909, p. 166 (Mocovi, San Vicente, and Ocampo, Argentina; descr. nest and eggs).—DABBENE, An. Mus. Nac. Buenos Aires, vol. 23, 1912, p. 348 (Villa Rica, Paraguay; Paraguayan refs.; crit.).—HELLMAYR, Nov. Zool., vol. 28, 1921, p. 244 (crit. on type; range, etc.).
- Basileuterus leucoblepharus superciliosus* HELLMAYR, Nov. Zool., vol. 28, 1928, p. 244, in text (range; crit.).
- Basileuterus leucoblepharides leucoblepharides* WETMORE, Bull. U. S. Nat. Mus., No. 133, 1926, p. 369 (Resistencia, Las Palmas, Riacho Pilaga, Argentina; San Vicente, Lazcano, and Rio Negro, Uruguay; habits; crit.).

Description.—Pileum, nape, and sides of the head and neck deep neutral gray, relieved by two broad but more or less irregular lateral stripes of black on the former, meeting on the forehead; short line through the eye black; supraloral streak grayish or whitish; upper and lower eyelids white; auriculars with some black mottling; upper parts, and wings and tail externally, bright olive green (between warbler green and olive green); under surface white, more or less mottled or clouded with neutral gray, particularly on the breast and sides; under tail-coverts strontian yellow to citron yellow; edge of the wing and under wing-coverts yellowish; "bill black; feet buff; iris light brown" (Foster).

Measurements.—Male (seven specimens): Wing, 65–71 (average, 68); tail, 58–64 (62); bill, 11–12 (11.7); tarsus, 22–26 (24). Female (three specimens): Wing, 63–64 (63.5); tail, 58–62 (60.5); bill, 11–11.5 (11.2); tarsus, 22–23 (22.5).

Range.—From the Chaco of eastern Bolivia eastward to Rio de Janeiro, and south to Uruguay.

Remarks.—Azara's description, which is the basis of Vieillot's name, is easily recognizable as applying to the present species. It was figured later by D'Orbigny, and in 1838 received an independent name from Swainson, based on specimens from Brazil. Both Burmeister and von Pelzeln, of the earlier authors, record it from that country, and a considerable number of specimens seem to have found their way into collections, judging from the numerous references in the literature. Our knowledge of its habits is derived mainly from D'Orbigny, and from the recent account by Doctor Wetmore, from which it appears that it is a ground bird, with a walking gait. This suggests that it may not be so closely related to the typical *Basileuteri* as its structural characters imply, and may not be so far removed from *Phaeothlypis*.

When Doctor Oberholser described his supposed race *calus* from Paraguay he had for comparison only four old and faded specimens from an unspecified locality, but probably from the coast region of Brazil. Since Paraguay is the accepted type-locality of *leucoblepharides*, the name *calus* is a synonym in any event. The type of *calus* can be matched so closely by a series of fresh specimens from Itatiaya that I cannot at all follow Doctor Hellmayr in recognizing two races of this species, from the interior and the coast region respectively. None of the characters he specifies hold good in the series available, but are attributable to other causes than geographical variation.

Specimens examined.—Brazil: Neu Freiburg, 1; Therezopolis (3,200 feet), Organ Mountains, 2; Alto Itatiaya (6,500–7,150 feet), Brazil, 4; Macieiras (5,900 feet), Serra do Itatiaya, 4; Jundiahy, 1; Jacuhy, Rio Grande do Sul, 1; São Laurencio, Rio Grande do Sul, 1; unspecified, 2. Uruguay: Castillos San Vicente, Rocha, 1; Rio Cebollati, Lazcano, Rocha, 1. Argentina: Las Palmas, Chaco, 1; Resistencia, Chaco, 1. Paraguay: Sapucay, 1; Paraná River, 1. Unspecified, 3. Total, 25.

BASILEUTERUS GRISEICEPS Sclater and Salvin

Basileuterus griseiceps SCLATER and SALVIN, Proc. Zool. Soc. London, 1868, p. 166 (Caripé, Venezuela), p. 170 (orig. descr.; type in coll. Brit. Mus.).—SHARPE, Cat. Birds Brit. Mus., vol. 10, 1885, p. 399 (Venezuela; descr.; refs.).—CHAPMAN, Amer. Mus. Nov. No. 191, 1925, p. 11 (Carapas, La Trinidad, and Mount Turumiquire, Venezuela).

Chlorospingus canipileus CHAPMAN, Bull. Amer. Mus. Nat. Hist., vol. 12, 1899, p. 153 (Los Palmares, Venezuela; orig. descr.; type in coll. Amer. Mus. Nat. Hist.).

Hemispingus canipileus SHARPE, Hand-list Birds, vol. 5, 1899, p. 644 (ref. orig. descr.; range).

Description.—Pileum dark neutral gray with a slight olivaceous cast, the forehead darker, more blackish; sides of the head like the

pileum, the lores dusky, and the supraloral line white; some fine white mottling or streaking under the eye; upper parts, and wings and tail externally, bright citrine; under parts yellow (empire yellow to light cadmium), nearly white on the chin, and the sides shaded with sulphine yellow; under wing-coverts dull yellow; "iris brown"; bill black; feet light brown (in skin).

Measurements.—Male (two specimens): Wing, 65; tail, 60; bill, 11; tarsus, 22. Female (three specimens): Wing, 58, 60, 60; tail, 55, 55, 57; bill, 11.5, 12, 12; tarsus, 22. (Two other specimens, one unsexed, the other marked "♀," measure respectively: wing, 63–64; tail, 58; bill, 11–12; tarsus, 21–22.)

Range.—Subtropical Zone, eastern coast mountains of Venezuela.

Remarks.—This remarkable and perfectly distinct species was discovered by Goering in the forest region of Caripé, Venezuela, and for many years was known from the type specimen alone. The second specimen that came to hand was collected by Mr. F. W. Ulrich at Los Palmales, in the same general region, and was promptly described by Doctor Chapman as a *Chlorospingus*, belonging to the group now segregated as *Hemispingus*. In view of its close general resemblance to certain members of that group the error was quite excusable. More recently Mr. G. H. H. Tate has secured six specimens, closely agreeing with each other and with Doctor Chapman's type of *canipileus*. In its gray head and yellow under parts the species agrees with *B. coronatus*, while otherwise it most nearly resembles *B. leucoblepharides*, and may stand between these two species in a linear sequence. It is a Subtropical Zone form, with no known representative in the Tropical Zone below.

Specimens examined.—Venezuela: Los Palmales, 1 (type of *Chlorospingus canipileus* Chapman); Carapas (5,600 feet), 2; La Trinidad (5,500 feet), 3; Mount Turumiquire (7,900 feet), 1. Total, 7.

BASILEUTERUS CASTANEICEPS CASTANEICEPS Sclater and Salvin

Basileuterus castaneiceps SCLATER and SALVIN, Proc. Zool. Soc. London, 1877, p. 521 (Jima, Ecuador; orig. descr.; type in coll. Brit. Mus.).—SHARPE, Cat. Birds Brit. Mus., vol. 10, 1885, p. 389, part (Sical and Jima, Ecuador; descr.).—CHAPMAN, Amer. Mus. Nov. No. 143, 1924, p. 9, in text, part (localities in Ecuador and Peru; crit.)

Description.—Above olivaceous brown (light medal bronze), somewhat lighter posteriorly, the wings and tail externally somewhat brighter (nearer citrine); crown medially rich orange brown (between Mars yellow and Sudan brown), inclosed between two black lateral lines running from the forehead to the nape; sides of head (including superciliaries) neutral gray, with a dusky line through the eye, and with a trace of whitish above the lores; under parts

white, with a light grayish wash, and the sides and flanks shaded with olive brown; crissum cream buff; feet pale (in skin).

Individuals not fully mature have the nape and sides of the head (the superciliaries in particular) washed with greenish like the back, and the greater wing-coverts edged with rusty. The black lateral crown-stripes are not so sharply defined.

Measurements.—Male: Wing, 67–72 (average, 68.5); tail, 59–63 (60.7); bill, 11–12 (11.5); tarsus, 23–24 (23.7). Female (eight specimens): Wing, 63–66 (64.5); tail, 50–60 (57.5); bill, 10.5–12 (11); tarsus, 21–23 (22).

Range.—Andes of southern Ecuador and northwestern Peru, in the Subtropical Zone.

Remarks.—A few of the specimens examined show a trace of yellow on the median under parts, but in no case is this color so strongly developed as in the race *orientalis*. The series in general agree well with a topotype from Jima, Ecuador, in the collection of the United States National Museum. The range of the typical race is somewhat restricted, and until quite recently very few specimens were known. The species appears to be most nearly allied to *B. coronatus*, having the same head pattern and general coloration, but differs from that form in its whitish instead of yellow under parts, in which respect it approaches *B. leucoblepharides*.

Specimens examined.—Ecuador: "Guayaquil," 1; Jima, 1; Govinda, 1; Zaruma (6,000 feet), Oro, 2; El Chiral (5,350 feet), Oro, 3; Loja (7,000 feet), 4; Taraguacocha (9,750 feet), Oro, 2; Salvias (3,600 feet), Oro, 5. Peru: El Tambo (9,400 feet), Piura, 2; Palambla (3,900–6,500 feet), Piura, 6; Lomo Santo (5,000 feet), lower Marañon Valley, 2. Total, 29.

BASILEUTERUS CASTANEICEPS ORIENTALIS Chapman

Basileuterus castaneiceps (not of Sclater and Salvin) TACZANOWSKI and VON BERLEPSCH, Proc. Zool. Soc. London, 1885, p. 74 (Machay and San Rafael, Ecuador).—GOODFELLOW, Ibis, 1901, p. 315 (Baeza, Ecuador).

Basileuterus castaneiceps orientalis CHAPMAN, Amer. Mus. Nov. No. 143, 1924, p. 8 (Mount Sumaco [type locality] and Baeza, Ecuador; orig. descr.; type in coll. Amer. Mus. Nat. Hist.).

Subspecific characters.—Similar to *B. castaneiceps castaneiceps* of southern Ecuador, but slightly larger; upper parts brighter, less brownish olive green (between dark citrine and olive green); lateral crown stripes and transocular stripes broader; and under parts darker, more grayish, and with more yellow wash on the abdomen and flanks; crissum also more decidedly yellow.

Measurements.—Male: Wing, 69–74 (average, 72); tail, 61–66 (63.5); bill, 11–12 (11.5); tarsus, 21.5–24.5 (22.5). Female (five

specimens): Wing, 66-69 (67.5); tail, 57-59 (58); bill, 11-12 (11.5); tarsus, 22-23 (22.5).

Range.—Andes of Ecuador, on the eastern or Amazonian slope (except in the southern portion), in the Subtropical Zone.

Remarks.—A well-marked race, described by Doctor Chapman after comparison with a good series of the typical form. In its greener upper parts and yellower under parts this race approaches still more closely to *B. coronatus* than does typical *castaneiceps*. The color of the coronal spot varies from amber brown to raw sienna. It is confined to the Subtropical Zone of the Amazonian slope in Ecuador, but is replaced toward the south, however, by the typical race, which here occupies both slopes of the Andes.

Specimens examined.—Ecuador: Galgalan (10,000 feet), Rio Upano, 1; Baeza, 4; above Baeza, 3; Ayacachi, 3; Puente del Rio Quijos, 1; Lower Rio Jardinas, 1; upper Rio Sumaco, 6 (including type); San Rafael, 1; Machay, 1. Total, 21.

BASILEUTERUS CASTANEICEPS CHAPMANI, new subspecies

Basileuterus castaneiceps (not of Selater and Salvin) TACZANOWSKI, Proc. Zool. Soc. London, 1879, p. 223 (Tambillo, Peru; Orn. Perou, vol. 1, 1884, p. 474, Tables, p. 29 (Cutervo and Tambillo, Peru; descr.; refs.; habits).—SHARPE, Cat. Birds Brit. Mus., vol. 10, 1885, p. 389, part (Tambillo, Peru).—STOLZMANN, Proc. Zool. Soc. London, 1885, p. 423 (plum.; range).—CHAPMAN, Amer. Mus. Nov. No. 143, 1924, p. 9, in text, part (Chaupe, Peru).

Type.—No. 181,624, Collection American Museum of National History, adult male; Chaupe (6,100 feet), north Peru, February 14, 1923; H. Watkins.

Subspecific characters.—Similar to *Basileuterus castaneiceps castaneiceps*, but upper parts, etc., darker and browner (medal bronze); coronal stripe averaging darker (near Sudan brown); and under parts with more grayish suffusion on the throat and breast.

Measurements.—Male (five specimens): Wing, 66-72 (average, 68.5); tail, 58-63 (60.5); bill, 11-12 (11.5); tarsus, 21-23 (22). Female (one specimen): Wing, 63; tail, 57; bill, 13 (?); tarsus, 21.5.

Range.—Subtropical Zone, Andes of northern Peru.

Remarks.—In its darker general coloration this southern race of *castaneiceps* lies at the opposite extreme from *orientalis*, and is as easily recognizable as that form. The peculiarities of Peruvian specimens were first remarked by Taczanowski and von Berlepsch,⁷ who, however, did not formally separate them, nor did Doctor Chapman see fit to do so when describing his *orientalis*. With six specimens before me, including two from Tambillo, collected by M. Stolzmann, I find the differences above given so constant and pronounced

⁷ Proceedings Zoological Society of London, 1885, p. 74.

that I have no alternative but to separate them under another name, given in honor of Dr. Frank M. Chapman, in recognition of his excellent revisionary work on this genus.

Specimens examined.—Peru: Chaupe (6,100 feet), 4; Tambillo, 2. Total, 6.

***BASILEUTERUS CORONATUS NOTIUS*, new subspecies**

Basileuterus coronatus (not *Myiodiodes coronatus* von Tschudi) CHAPMAN, Bull. Amer. Mus. Nat. Hist., vol. 55, 1926, p. 601, part (Locotal and Roquefalta, Bolivia).

Type.—No. 85,521, Collection Carnegie Museum, adult "male"; Yungas de Cochabamba, Bolivia, July 10, 1921; José Steinbach.

Subspecific characters.—Similar to *B. coronatus coronatus* of Peru, but rather smaller; upper parts, etc., darker, less brownish, more olive green; under parts with more pyrite yellow shading on the breast and sides, giving a generally darker effect.

Measurements.—Male (two specimens): Wing, 67–71; tail, 59–60; bill, 11.5; tarsus, 21.5–22. Female (four specimens): Wing, 60–65 (average, 63); tail, 53–56 (54); bill, 10.5–11.5 (11); tarsus, 20.5–23 (22).

Range.—Subtropical Zone, eastern slope of the Andes of Bolivia.

Remarks.—This is a readily distinguishable race, in which the upper parts are darker olive green even than in the Colombian form, and the coronal spot is also darker. It appears to be confined to the Subtropical Zone on the eastern slope of the Andes in the Yungas of Bolivia, so far as known at present. In addition to the four specimens in the Carnegie Museum and the American Museum of Natural History, I have examined five others in the von Berlepsch Collection, deposited in the Frankfurt Museum in Germany. None of these have been recorded in print before; in fact the species was not known to range farther south than Peru. The specimen selected as a type is almost certainly wrongly sexed.

Specimens examined.—Bolivia: Yungas de Cochabamba, 2; Locotal (5,800 feet), Cochabamba, 1; Roquefalta, Cochabamba, 1; Quebranda Honda, 5. Total, 9.

***BASILEUTERUS CORONATUS CORONATUS* (von Tschudi)**

Myiodiodes coronatus VON TSCHUDI, Arch. f. Naturg., vol. 10, pt. 1, 1844, p. 283 ([Chanchamayo Valley], Peru; orig. descr.; type in coll. Mus. Neuchâtel); Fauna Peruana, Aves, 1845–46, pp. 28, 193, pl. 14, fig. 1 (Chanchamayo Valley, Peru; descr.).

Basileuterus coronata BONAPARTE, Conspectus Avium, vol. 1, 1850, p. 314 (in list of species; ref. orig. descr.).

Basileuterus coronatus TACZANOWSKI, Proc. Zool. Soc. London, 1874, p. 509 (Paltaypampa and Auquimarca, Peru); Orn. Perou, vol. 1, 1884, p. 476, part (Paltaypampa, Peru).—SHARPE, Cat. Birds Brit. Mus., vol. 10, 1885,

p. 390, part (Auquimarca, Peru).—VON BERLEPSCH and STOLZMANN, *Proc. Zool. Soc. London*, 1896, p. 331 (Vitoc, Garita del Sol, Peru); *Ornis*, vol. 13, 1906, p. 75 (Idma, Santa Ana, Peru), p. 107 (Huaynapata, Peru).—CHAPMAN, *Bull. U. S. Nat. Mus.*, No. 117, 1921, p. 107 (Idma, San Miguel Bridge, and Torontoy, Urubamba Valley, Peru).

Description.—Pileum with two broad lateral stripes of black, extending from the forehead to the nape, and inclosing a median coronal spot or stripe of deep orange rufous or Sanford's brown; sides of head (including broad superciliaries) and of neck deep neutral gray, with a blackish transocular stripe, fading into pallid neutral gray on the throat; upper parts, and wings and tail externally, between dark citrine and medal bronze; under parts, from the breast down, lemon chrome, the sides shaded with pyrite yellow, the crissum sometimes more buffy (near old gold); under wing-coverts dull yellowish white; bill brownish black; feet pale brownish (in skin).

Measurements.—Male: Wing, 70–77 (average, 72); tail, 57–64 (61); bill, 11–12 (11.3); tarsus, 21.5–24 (22.5). Female: Wing, 63–70 (66); tail, 53–59 (56); bill, 10.5–11.5 (11.2); tarsus, 21–22 (21.5).

Range.—Subtropical Zone, Andes of central and southern Peru, south to the Urubamba Valley.

Remarks.—Immature birds of this species may readily be told by the rusty tips to the greater wing-coverts and by the olive greenish nape and sides of the head.

In its pattern of coloration and proportions this species is a typical *Basileuterus*. The black transocular stripe is not mentioned in the original description nor shown in the plate, the colors of which are poor. The type specimen, kindly placed at my disposal by Dr. Otto Führmann of the Neuchâtel Museum, was exposed to the light for many decades, so long in fact that its original colors appear to have been considerably changed. Indeed, it actually agrees better with the Ecuador race about to be described than with Peruvian specimens, but Doctor Hellmayr, who has again examined it at my request, is confident that this is due entirely to post-mortem changes in the skin. He points out that von Tschudi did not extend his travels in Peru beyond the Department of Junin toward the north. There is nothing on the label of the type to show whence it came, other than "Perou," but in his *Fauna Peruana* von Tschudi expressly gives the type locality as "Urwäldern des Chanchanayo [sic] gebietes," i. e., Chanchamayo Valley. Freshly collected specimens from this general region agree with the description as given above. There is some variation in the color of the upper parts, but not more than in the other races of this species, which appear to be sufficiently well differentiated.

Specimens examined.—Peru: Idma (5,000 feet), Santa Ana, 6; Chinchao, 1; Uchco, 2; Inca Mine, 1; San Miguel (5,000 feet), Urubamba Cañon, 4; Vitoc, Garita del Sol, 1; Huaynapata, Marcapata, 3; Utcuyacu (4,800 feet), Junin, 8; Rumicruz (9,700 feet), Junin, 5; Chelpes (7,500 feet), Junin, 5; Santa Rita, Urubamba Cañon, 1; unspecified, 1 (the type). Total, 38.

BASILEUTERUS CORONATUS ELATUS, new subspecies

Basileuterus coronatus (not *Myiodiocetes coronatus* von Tschudi) SCLATER, Proc. Zool. Soc. London, 1859, p. 137 (Pallatanga, Ecuador).—BAIRD, Rev. Amer. Birds, 1865, p. 242 (diag.), p. 244, part (Ecuador).—SCLATER, Proc. Zool. Soc. London, 1865, p. 284, part (refs.; diag.; range).—TACZANOWSKI, Proc. Zool. Soc. London, 1882, vol. 3, p. 6 (Cocochó, Rayurmana, Chachapoyas, and Tamiapampa, Peru).—HEINE and REICHENOW, Nom. Mus. Heineani Orn., 1882, p. 14, part (Pallatanga, Ecuador).—VON BERLEPSCH and TACZANOWSKI, Proc. Zool. Soc. London, 1884, p. 286 (Cayandede, Tribulputa, and Cechce, Ecuador; crit.).—TACZANOWSKI, Orn. Perou, vol. 1, 1884, p. 476, part, Tables, p. 29, part (Cocochó, Rayurmana, Chachapoyas, and Tamiapampa, Peru; descr.; refs.; range).—SHARPE, Cat. Birds Brit. Mus., vol. 10, 1885, p. 390, part (Jima and Pallatanga, Ecuador; descr.; refs.).—STOLZMANN, Proc. Zool. Soc. London, 1885, p. 423 (plum.; faunal range).—SALVADORI and FESTA, Boll. Mus. Zool. ed Anat. comp. Torino, vol. 15, No. 357, 1899, p. 9 (Nanegal and Niebli, Ecuador; refs.).—GOODFELLOW, Ibis, 1901, p. 314 (Milligalli and Cauzacota, Ecuador; plum.).—MÉNÉGAUX, Mission Service Geog. Mes. Arc Méridien Equat. Amér. du Sud, vol. 9, pt. 1, 1911, p. B 73 (Nono and Quito, Ecuador; Ecuador refs.).—LÖNNBERG and RENDAHL, Ark. f. Zool., vol. 14, No. 25, 1922, p. 78 (road to Nanegal, Ecuador; habits).—CHAPMAN, Bull. Amer. Mus. Nat. Hist., vol. 55, 1926, p. 601, part (Verdacochoa, road to Nanegal, and Pallatanga, Ecuador; Ecuador refs.; crit.).

Type.—No. 59,787, Collection Academy of Natural Sciences of Philadelphia, adult male; Pagma forest, Hacienda Jalancay, near Chunchi (6,200–7,400 feet), Ecuador, March 24, 1911; Samuel N. Rhoads.

Subspecific characters.—Similar to *Basileuterus coronatus coronatus*, but averaging a little smaller; upper parts in general less olive greenish, more brownish in tone; throat paler gray; flanks and crissum shaded with olive ocher; and black lateral crown-stripes narrower and less prominent, not meeting in front, while the orange rufous coronal part is correspondingly larger. "Bill brown, darker above; feet nearly orange" (Fraser).

Measurements.—Male: Wing, 66–71 (average, 68); tail, 57–61 (58.5); bill, 11–12 (11.5); tarsus, 21.5–23.5 (22.5). Female (seven specimens): Wing, 60–65 (63); tail, 53–59 (55.5); bill, 11–12 (11.4); tarsus, 21.5–24 (22.5).

Range.—Subtropical Zone, Andes of Ecuador and northern Peru.

Remarks.—The late Count von Berlepsch remarked the peculiarities of Ecuador examples of *Basileuterus coronatus* in 1884, and the following year Sharpe also called attention to their characters as compared with specimens from other parts. The present form differs more from the Colombian and Peruvian races, respectively, than these do from each other. From the former it differs in its more deeply colored (darker) coronal spot, the more brownish olive tone of the upper parts in general, and the more buffy, less greenish wash on the flanks and crissum. From the latter it differs in respect to the color of the upper parts and posterior lower parts, as already said, and also in its paler, more whitish throat. From both it differs in its relatively much narrower black lateral crown-stripes and correspondingly wider and more prominent coronal spot, which reaches the base of the bill in front and very nearly covers the crown. All these characters are well developed in specimens from Ecuador, while skins from northern Peru (Provinces of Piura and Amazonas) are more or less intermediate.

Specimens examined.—Ecuador: Cayandeled, 2; Huigra (4,800–5,000 feet), Chimbo, 3; Pagma forest, Hacienda Jalancay, near Chunchi (6,200–7,400 feet), 6; Guallea, 1; road to Nanegal, 1; Pallatanga, 2; Verdacocha, Pichincha, 1; Chaguarpata, 1; Tribulpata, 1; Tambillo (3 leagues south of Quito), 1. Peru: Ray-urmana, 2; Chachapoyas, 3; Coccochó, 1; Tamiapampa, 1; Levanto (9,000 feet), 1; Molinopampa, 1; La Lejia (about 9,000 feet), north of Chachapoyas, 3. Total, 31.

BASILEUTERUS CORONATUS REGULUS, new subspecies

Basileuterus coronatus (not *Myiodiocetes coronatus* von Tschudi) SCLATER, Proc. Zool. Soc. London, 1855, p. 144 ("Bogotá," Colombia).—BAIRD, Rev. Amer. Birds, 1865, p. 244, part ("Bogotá," Colombia, in range).—SCLATER, Proc. Zool. Soc. London, 1865, p. 284, part (New Granada, in range).—SCLATER and SALVIN, Proc. Zool. Soc. London, 1875, p. 234 (Merida, Venezuela); 1879, p. 494 (Santa Elena, Antioquia, Colombia; descr. nest and eggs).—SHARPE, Cat. Birds Brit. Mus., vol. 10, 1885, p. 390, part ("Bogotá," Medellín, Santa Elena, and Antioquia, Colombia; descr.; refs.).—CHAPMAN, Bull. Amer. Mus. Nat. Hist., vol. 36, 1917, p. 552, excl. Peruvian refs. and records (Colombian localities and range).

Type.—No. 37,177, Collection Carnegie Museum, adult male; Paramo de Rosas, Venezuela, March 7, 1911; M. A. Carriker, jr.

Subspecific characters.—Similar to *Basileuterus coronatus coronatus*, but median crown-spot paler, Mars yellow rather than orange rufous, and upper parts purer olive green (near citrine), less brownish in tone.

Measurements.—Male: Wing, 69–76 (average, 74); tail, 61–66 (63.5); bill, 10.5–11.5 (11); tarsus, 22–24 (23). Female: Wing, 66–

73 (68.5); tail, 57-64 (60.5); bill, 10.5-12 (11); tarsus, 20.5-22.5 (21.5).

Range.—Subtropical Zone, Andes of Colombia and Andes of Venezuela.

Remarks.—Although specimens of *Basileuterus coronatus* from Colombia have been extant in collections for many years, their distinctive characters seem to have gone unnoticed, except for a brief remark by Sharpe in 1885. Doctor Chapman, who handled a good series, indeed said that they do not differ from the single Peruvian specimen he had for comparison at that time. But with much more and better material from Peru now available, it appears that the Colombian bird is an easily distinguishable race, recognizable by its more greenish coloration above and its brighter coronal spot. The color of this spot varies somewhat, from Mars yellow to cadmium yellow, but it is uniformly brighter than in the typical Peruvian bird. It is still more different from the Ecuador bird, as said under the head of that form. A good series from the Andes of Merida agree closely with birds from the Eastern and Central Andes of Colombia, but those from the Western Andes differ in having the wings and tail more brownish, less greenish, thus approaching *elatus* in this respect. An interesting example in full juvenal dress (No. 89,500, Collection Carnegie Museum, La Cuchilla, Merida, Venezuela, June 14) is almost uniformly olivaceous, except for the abdomen medially, which is dull yellow, with the crissum paler; the tawny orange crown-patch is just appearing. In adult birds the iris is marked as "brown; feet brownish yellow; bill black" (Carriker).

Specimens examined.—Venezuela: Paramo de Rosas, 10; Guamito, Trujillo, 5; La Cuchilla, Merida, 6; Tabay, Merida, 1; Heights of Tabay, 1; Merida, 4; Rio Mucujon, 1; Escorial, Merida, 1; Nevados, Merida, 1; Sierra, Merida, 1. Colombia: Heights of Caldas, 2; La Cumbre, Valle, 1; "Bogotá," 12; Subia, near La Mesa (1,900 m.), Cundinamarca, 3; El Roble (8,000 feet), above Fusugasuga, 1; El Roble (7,200 feet), Quindio Andes, 2; Aguadita (6,500 feet), above Fusugasuga, 2; Fusugasuga (6,000 feet), 2; La Candela (6,500 feet), Huila, 1; Rio Zapata, 1; Rio Lima, 1; Cauqueta, 1; El Eden (8,300 feet). E. Quindio Andes, 4; Laguneta (10,300 feet), W. Quindio Andes, 1; Salento (7,000 feet), W. Quindio Andes, 2; W. Quindio Andes (9,000 feet), above Salento, 1; Almaguer (10,300 feet), Central Andes, Cauca, 1; San Antonio (6,600 feet), Cauca, 10; La Maria (4,700 feet), Dagua Valley, 2; San Antonio (5,800 feet), Rio Cali, 8; Santa Elena (9,000 feet), Antioquia, 4; Cerro Munchique (8,325 feet), Coast Range W. of Popayan, Cauca, 9; Las Lomitas, 1. Total, 103.

BASILEUTERUS CINEREICOLLIS Sclater

Basileuterus cinereicollis SCLATER, Proc. Zool. Soc. London, 1864, p. 166 ("Bogotá," Colombia; orig. descr.; type in coll. Brit. Mus.).—BAIRD, Rev. Amer. Birds, 1865, p. 242 (diag.), p. 244 (ref. orig. descr.).—SCLATER, Proc. Zool. Soc. London, 1865, p. 285, pl. 9, fig. 2 (diag.; range).—SHARPE, Cat. Birds Brit. Mus., vol. 10, 1885, p. 382 ("Bogotá," Colombia; descr.; refs.).—VON BERLEPSCH and LEVERKÜHN, Ornith., vol. 6, 1890, p. 7 ("Bogotá," Colombia; crit.).—CHAPMAN, Bull. Amer. Mus. Nat. Hist., vol. 36, 1917, p. 550 (Buena Vista, Colombia; crit.).—TODD and CARRIKER, Ann. Carnegie Mus., vol. 14, 1922, pp. 86, 442, in text (State of Santander, Colombia; range; crit.; habits).

Description.—Head dark neutral gray, this color extending over the nape and sides of the head; pileum with two blackish lateral stripes of black, not sharply defined, inclosing a large coronal spot of lemon chrome (some of the feathers with slight darker tips); indistinct supraloral streak paler gray; upper parts, and wings and tail externally, bright olive citrine; throat and breast grayish (pallid neutral gray medially); rest of under parts lemon yellow, duller on the crissum, the sides and flanks washed with pyrite yellow; under wing-coverts dull pyrite yellow; "iris brown; bill blackish; feet pale brownish yellow" (Carriker).

Measurements.—Male (seven specimens): Wing, 67–70 (average, 69.5); tail, 58–63 (60); bill, 10–12 (11); tarsus, 21–22 (21.5). Female (eight specimens): Wing, 62–67 (65); tail, 57–61 (60); bill, 10.5–11 (10.8); tarsus, 20.5–22 (21).

Range.—Subtropical Zone, Eastern Andes of Colombia.

Remarks.—Until more recent years this species appears to have been known only from "Bogotá" skins, when reported by Doctor Chapman from the definite locality Buena Vista, on the eastern slope of the Eastern Andes. Mr. Carriker met with it in the region of Ocaña, farther north, on both slopes of the range, and secured a good series of specimens, which have been made the basis for some critical remarks by the writer. The species clearly belongs to the same group as *B. coronatus*, but differs decidedly from that species in its less sharply defined lateral crown-stripes, yellow instead of orange rufous vertical stripe, and greater extent of gray on the breast. It bears a remarkable superficial resemblance to *Oporornis philadelphia* and *O. agilis* in general appearance.

Three individuals in the collection of the Carnegie Museum which I take to be younger birds (August 12 and 15) differ from the adults in having the head more or less washed with the color of the back, the lateral crown-stripes barely indicated, and the coronal spot duller and reduced in size. In some adults the coronal spot inclines more to light cadmium.

Specimens examined.—Colombia: El Cauca, 1; La Palmita, 4; Pueblo Nuevo, 3; Rio Negro, 7; Buena Vista (above Villavicencio), 5. Total, 20.

***BASILEUTERUS CONSPICILLATUS* Salvin and Godman**

Basileuterus conspicillatus SALVIN and GODMAN, Ibis. 1880, p. 117 (San José, Colombia; orig. descr.; type in coll. Brit. Mus.).—SHARPE, Cat. Birds Brit. Mus., vol. 10, 1885, p. 389 (San José, Colombia; descr.).—SALVIN, Ibis, 1887, p. 130, in text (Sierra Nevada de Santa Marta, Colombia).—CHAPMAN, Bull. Amer. Mus. Nat. Hist., vol. 36, 1917, p. 551, in text (crit.).—TODD and CARRIKER, Ann. Carnegie Mus., vol. 14, 1922, pp. 54, 84, 86, 124, 441 (Santa Marta localities and refs.; range; crit.).

Basileuterus cinereicollis (not of Sclater) BANGS, Proc. Biol. Soc. Washington, vol. 12, 1898, p. 160 (Pueblo Viejo, Colombia), p. 180 (San Francisco and Palomina, Colombia).—ALLEN, Bull. Amer. Mus. Nat. Hist., vol. 13, 1900, pp. 120, 175 (Las Nubes, Onaca, Valparaiso, and El Libano, Colombia; plum.: crit.).—SHARPE, Hand-List Birds, vol. 5, 1909, p. 123, note (crit.).

Description.—Head deep neutral gray, spreading over the nape, the throat paler (pallid neutral gray); pileum with two broad lateral stripes of black, meeting on the forehead, and inclosing a coronal spot which varies in color from lemon yellow to Mars yellow; short superciliaries (not reaching beyond the eye) and lower eyelid white; lores and auricular region blackish slate, the latter not in sharp contrast with the sides of the neck; upper parts, and wings and tail externally, light olive green (between olive green and warbler green); under parts, from the breast down, lemon chrome, the crissum usually paler, and sometimes inclining to aniline yellow, the sides more or less washed with pyrite yellow; "iris brown; bill blackish, paler below; feet dusky yellow" (Carriker).

Measurements.—Male: Wing, 63–69 (average, 66); tail, 56–61 (59); bill, 9.5–11 (10.5); tarsus, 20–22 (21). Female: Wing, 61–68 (63); tail, 54–60 (56.6); bill, 10–11 (10.5); tarsus, 20–22 (20.5).

Range.—Subtropical Zone, Sierra Nevada de Santa Marta, Colombia.

Remarks.—*Basileuterus conspicillatus* is the Santa Marta representative of *B. cinereicollis*. It differs from that species in its brighter yellow under parts, with the gray color confined to the throat, its brighter green upper parts, its rather more distinct head markings, and its whitish instead of greenish under wing-coverts. These differences impress one as being of specific value. The variation in the color of the coronal spot is remarkable, but is surely not due to age. In juvenal dress the gray of the head and throat is replaced by dull olive with a brownish wash, and the stripes are not in evidence.

In describing this species Salvin and Godman compared it with *B. coronatus*, which led several authors to infer that it was identical

with *B. cinereicollis* of the Eastern Andes of Colombia. The question has been fully discussed by Doctor Chapman and the writer, as shown in the above references.

Specimens examined.—Colombia: Las Nubes, 10; Valparaiso, 16; Cincinnati, 10; San Lorenzo, 5; Las Taguas, 2; Sierra Nevada de Santa Marta (6,000 feet), 1; Las Vegas, 5; Minca, 1; Pueblo Viejo, 5; San Miguel, 3; La Concepción, 10; Chirua (7,000 feet), 9; San Antonio, 1; Palomina, 3; San Francisco, 3; El Libano, 5. Total, 89.

BASILEUTERUS FRASERI FRASERI Sclater

Basileuterus chrysogaster (not *Setophaga chrysogaster* von Tschudi) SCLATER, Proc. Zool. Soc. London, 1859, p. 137, excl. syn. (Pallatanga, Ecuador); 1865, p. 284, part (refs.; diag.; range).

Basileuterus fraseri VON BERLEPSCH and TACZANOWSKI, Proc. Zool. Soc. London, 1883, p. 541, part (Chimbo, Ecuador; nomen nudum, ex Sclater, MS.).—SCLATER, Proc. Zool. Soc. London, 1883, p. 653, part, pl. 61 (Pallatanga, Ecuador; orig. descr.; type in coll. Brit. Mus.).—VON BERLEPSCH and TACZANOWSKI, Proc. Zool. Soc. London, 1884, p. 286 (Pedregal, Ecuador).—SHARPE, Cat. Birds Brit. Mus., vol. 10, 1885, p. 394, part (Pallatanga, Ecuador; descr.; refs.).—TACZANOWSKI and VON BERLEPSCH, Proc. Zool. Soc. London, 1885, p. 120 (range).—HARTERT, Nov. Zool., vol. 5, 1898, p. 480 (Chimbo, Ecuador).

Basileuterus fraseri fraseri CHAPMAN, Amer. Mus. Nov. No. 18, 1921, p. 11, in text (Pallatanga, Santa Rosa, Zaruma, Portovelo, El Chiral, Salvias, and Alamor, Ecuador; range; crit.).

Description.—Pileum with two broad lateral stripes of black, coalescing on the forehead, and inclosing a large coronal spot of lemon chrome; lores blackish; supraloral spot and chin spot white; sides of head (including superciliaries) and neck, and entire upper parts, including the wings and tail externally, slate color to slate gray, the black more or less washed with olive green; under parts lemon chrome, paler, even whitish, on the crissum and tibiae, the sides washed with warbler green; under wing-coverts white; bill black; feet pale (in skin).

If the sexing is correct the female is like the male. A certain proportion of the specimens examined, however, differ in having the lateral crown-stripes restricted posteriorly, not extending over the nape; the vertical spot, too, is duller and smaller, and the greater wing-coverts show slight whitish tipping. These are probably immature. In juvenal dress (illustrated by No. 172,243, Collection American Museum of Natural History, Portovelo, Ecuador, August 1) the general coloration is much duller, the yellow crown-spot alone is indicated of the head markings, and the yellow below has traces of darker spotting.

Measurements.—Male: Wing, 62–70 (average, 67); tail, 55–63 (59); bill, 11.5–13 (12); tarsus, 21.5–23.5 (22.5). Female: Wing, 60–65 (62); tail, 52–57 (55.5); bill, 11.5–12 (12); tarsus, 21–23 (22).

Range.—Andean Region of Ecuador, from the Rio Chimbo southward, in the Tropical and Subtropical Zones, to the Province of Piura, Peru.

Remarks.—This very distinct and isolated species was at first confused with the *Setophaga chrysogaster* of von Tschudi, which is a species related to *Basileuterus bivittatus* (D'Orbigny and Lafresnaye), and so it was not formally described as new until as late as 1883. The name *fraseri*, although given by Sclater, was actually first published by von Berlepsch and Taczanowski in connection with specimens from Chimbo and Guayaquil, and if the expression "iris brun foncé" used in this connection is to be construed as a description the name would have to be attributed to these authors and the type locality fixed as Chimbo. But I am not prepared to insist upon such a literal construction under the circumstances.

Basileuterus fraseri goes far beyond *B. coronatus* in the development of the gray of the head, which spreads over the upper parts, including the wings and the tail, the green color being reduced to a mere wash on the middle of the back. This gray color has a decided bluish cast, not approached by that of any other species of *Basileuterus*. The yellow of the under parts is bright, and includes the throat. The coloration in general, and the head pattern in particular, are a close counterpart of that of *Euthlypis lachrymosa* of western Mexico, and suggest their relationship in spite of certain differences of proportion which are now regarded as of generic value, and their discontinuous distribution.

In the southern part of its range the color of the coronal spot, which is the chief character of *fraseri*, appears to be fairly constant, but toward the north this character varies greatly, even in specimens from the same locality. A series of four skins from Coco, for example, show a nearly complete transition from the typical race to *ochraceicrista*. Sclater's type from Pallatanga, however, was a yellow-crowned individual, as shown in the plate. The Chimbo example referred to by von Berlepsch and Taczanowski, now before me, has some of the crown-feathers orange-tipped, while a second (immature) example from the same place (No. 173,527, Collection American Museum of Natural History) happens to be closer to the *ochraceicrista* type.

Specimens examined.—Ecuador: La Chonta (2,000 feet), Oro, 19; Santa Rosa, Oro, 13; Guainche (3,200 feet), Loja, 4; Pullango (900 feet), Loja, 2; Naranjo (2,000 feet), Guayas, 2; Lunamá (4,600 feet), Loja, 1; Portovelo (2,000–2,700 feet), Oro, 9; Punta Santa Ana (3,650–4,500 feet), Portovelo–Loja trail, Oro, 2; Cebollal (3,100 feet), Loja, 2; Alamor (4,550 feet), 5; Coco, Rio Chimbo, 5 (intermediate); Salvias, Zaruma–Zaraguro trail (3,600 feet), Oro, 1; El Chiral (5,350 feet), Santa Rosa–Zaruma trail, Oro, 2; Junction

Chanchan and Chiguancay Rivers, 4; Pedregal, 1; Chimbo, 2 (intermediate); La Puente, 2; Las Pinas, Alamor Range, 1; Zaruma, 1; Rio Jubones, 1. Peru: Paletillas (1,550 feet), Piura, 8; Palambla (3,900-6,500 feet), Piura, 6; Milagros (2,200 feet), Piura, 1. Total, 94.

BASILEUTERUS FRASERI OCHRACEICRISTA Chapman

Basileuterus chrysogaster (not *Scetophaga chrysogaster* von Tschudi) SCLATER, Proc. Zool. Soc. London, 1860, p. 273 (Babahoyo, Ecuador); Proc. Zool. Soc. London, 1865, p. 284, part (refs.; diag.; range).

Basileuterus fraseri VON BERLEPSCH and TACZANOWSKI, Proc. Zool. Soc. London, 1883, p. 541, part (Guayaquil, Ecuador).—SCLATER, Proc. Zool. Soc. London, 1883, p. 653, part (Babahoyo, Ecuador).—SHARPE, Cat. Birds Brit. Mus., vol. 10, 1885, p. 394, part (Babahoyo, Santa Rita, and Balzar, Ecuador).—TACZANOWSKI and VON BERLEPSCH, Proc. Zool. Soc. London, 1885, p. 120, part (range).—SALVADORI and FESTA, Boll. Mus. Zool. ed. Anat. comp. Torino, vol. 15, No. 357, 1899, p. 9, excl. syn. part (Vinces, Ecuador; refs.; crit.).

Basileuterus fraseri ochraceicrista CHAPMAN, Amer. Mus. Nov. No. 18, 1921, p. 11 (Chone [type locality], Guayaquil, Puna Island, Balzar, Santa Rita, Babahoyo, and Naranjito, Ecuador; orig. descr.: type in coll. Amer. Mus. Nat. Hist.).

Subspecific characters.—Similar to *Basileuterus fraseri fraseri*, but vertical spot Mars orange instead of bright yellow, at least superficially.

Measurements.—Male (five specimens): Wing, 67-70 (average, 69); tail, 55-61 (58.5); bill, 11-12.5 (12); tarsus, 21.5-23 (22). Female (four specimens): Wing, 57-65 (62); tail, 52-55 (53.5); bill, 11-12 (11.2); tarsus, 22-23 (22.5).

Range.—Arid Tropical Zone of western Ecuador, from the Province of Manavi south to Puna Island.

Remarks.—In separating this race from typical *fraseri* Doctor Chapman calls attention to the constancy of its characters in the Guayaquil region of Ecuador, intermediates coming from the edge of the forest region. In allocating the series examined I have relied very largely upon the characters shown by the individual specimens, aside from the locality. The race seems clearly entitled to recognition in spite of such discrepancies.

Specimens examined.—Guayaquil, 3; Bucay, Guayas, 4; Chonconcito, Guayas, 2; Chongon Hills, 2; Chimbo, 1; Chone, Manavi, 4 (including the type). Total, 16.

BASILEUTERUS FLAVEOLUS (Baird)

Muscicapa bivittata LAFRESNAYE and D'ORBIGNY, Syn. Avium, pt. 1, Mag. Zool., cl. ii, 1837, p. 51, part (Yungas, Chiquitos, Bolivia; descr. female). *Myiothlypis flaveolus* BAIRD, Rev. Amer. Birds, 1865, p. 252, note (Paraguay; orig. descr.; type in coll. U. S. Nat. Mus.).—VON PELZELN, Orn. Brasiliens, pt. 2, 1868, p. 72 (Rio das Pedras, Porto de Rio Parana, Goiaz, and Matto Grosso, Brazil; crit.).—GOELDI, Aves Brasil, 1894, p. 269 (local range).

Basileuterus flavcolus SHARPE, Cat. Birds Brit. Mus., vol. 10, 1885, p. 380 (Bahia and Goyaz, Brazil; descr.; refs.).—ALLEN, Bull. Amer. Mus. Nat. Hist., vol. 3, 1891, p. 345 (Chapada and Bahia, Brazil; plum.; meas.; descr. eggs).—VON IHERING, Rev. Mus. Paulista, vol. 3, 1893, p. 134 (Brazilian localities).—SALVADORI, Boll. Mus. Zool. ed Anat. comp. Torino, vol. 15, No. 378, 1900, p. 3 (Urucum, Matto Grosso, Brazil; refs.).—ROBINSON and RICHMOND, Proc. U. S. Nat. Mus., vol. 24, 1901, p. 177 (La Guaira, Venezuela).—VON IHERING, Aves Brazil, 1907, p. 333 (Rincão, Avanhandava, and Bahia, Brazil; range).—HELLMAYR, Nov. Zool., vol. 15, 1908, p. 19 (Rio Araguaya, Bahia, and Maranhão, Brazil; Mount Bucarito, Tocuyo, Venezuela; Chiquitos, Bolivia; range; meas.; crit.).—VON BERLEPSCH, Nov. Zool., vol. 15, 1908, p. 107, note (Puerto Cabello, Venezuela, and Bahia, Brazil).—REISER, Denks. Math.-Nat. Kl., K. Akad. Wiss. Wien, vol. 76, 1910, p. 78 (Santa Rita, Missão, and Paranaguá, Brazil).—GRANT, Ibis, 1911, p. 89 (Sapatero Cué, Paraguay).—HELLMAYR and VON SEILERN, Arch. f. Naturg., vol. 78, A, 1912, p. 47 (Las Quiguas, Venezuela; refs.; crit.).—MÉNÉGAUX, Rev. Française d'Orn., vol. 5, 1917, p. 85 (Caceres, Matto Grosso, Brazil).—HELLMAYR, Nov. Zool., vol. 32, 1925, p. 181 (Chiquitos, Bolivia; range; crit.).—WETMORE, Bull. U. S. Nat. Mus., No. 133, 1926, p. 370 (Puerto Pinasco, Paraguay; habits).—SNETHILAGE, Journ. f. Orn., vol. 76, 1928, p. 536 (range in N. E. Brazil).

Description.—Above, including wings and tail externally, bright warbler green; below lemon chrome, the sides washed with pyrite yellow; indistinct superciliaries paler yellow, and upper and under eyelids still paler (baryta yellow); a dusky greenish transocular streak, restricted behind the eye; "iris brown; bill black; feet orange yellow" (Carriker).

An example in juvenal dress, with the postjuvenal moult beginning (No. 150,689, Collection American Museum of Natural History, El Liman, Venezuela, August 28, 1918) is much duller, the head markings faint, and the throat and breast dull olive like the back.

Measurements.—Male: Wing, 64–69 (average, 66); tail, 55–63 (62); bill, 11–12.5 (12); tarsus, 21–24 (22.5). Female: Wing, 58–67 (62.5); tail, 54–61 (58); bill, 11–12 (11.5); tarsus, 21–22.5 (21.5).

Range.—Tropical Zone, from eastern Brazil (States of Maranhão and Bahia) west through Matto Grosso to the Andes of Bolivia, and south to Paraguay and São Paulo, reappearing in northern Venezuela.

Remarks.—Baird described this species provisionally, on the chance that it might eventually prove distinct from *B. luteoviridis*, from a single specimen collected in Paraguay by Capt. T. J. Page. Long before this, however, a female had been taken in Bolivia by D'Orbigny, but confused with *B. bivittatus*, while Natterer had collected eight specimens in Brazil, as duly recorded by von Pelzeln. Its standing as a species has not been questioned, in spite of its admitted close relationship to *B. luteoviridis*. H. H. Smith secured a

large series of specimens at Chapada, Matto Grosso, which have found their way into several different collections, and of late years a good many have been collected in northern Venezuela. These Venezuelan examples are precisely like those from Brazil and other parts in all respects. The reappearance unchanged of this Brazilian species in northern Venezuela, after passing by the Amazon Valley, gives it a discontinuous range which is hard to explain, but which is paralleled in the case of a number of other birds.

At first glance one is tempted to place this species in *Myiothlypis*, but after going into the matter with some care I think that after all it is better referred to *Basileuterus*. It differs from the type of *Myiothlypis* in its slenderer, more pointed bill, its longer outermost primary, and in its lack of a crest; and agrees with *Basileuterus* in most respects save in style of coloration, and even here I find some specimens showing traces of a median paler stripe on the forehead. The feet are a little stouter than in the majority of the species of *Basileuterus*, but are not otherwise differently proportioned.

Specimens examined.—Paraguay: Puerto Pinasco, 2; Fort Wheeler, 1; unspecified, 1 (type of species). Brazil: Bahia, 21; Santa Amaro, Bahia, 1; Juá, near Iguatú, Ceará, 1; Chapada, Matto Grosso, 34; Urucum, 1. Bolivia: Monte de Basilio, 1; Rio Quiser, 1. Venezuela: San Esteban, 4; El Trompillo, 4; Sierra de Carabobo, 24; Macuto, Caracas, 2; La Guaira, 1; El Liman (1,000 m.), valley of Puerto La Cruz, 2; Galipán, 1. Total, 102.

BASILEUTERUS SIGNATUS SIGNATUS von Berlepsch and Stolzmann

Basileuterus signatus VON BERLEPSCH and STOLZMANN, Ornith., vol. 13, 1906, pp. 66, 74, excl. Bolivian locality (Idma, Santa Ana, Peru; orig. descr.; type in Warsaw Museum).

Basileuterus luteoviridis (not *Trichas luteoviridis* Bonaparte) CHAPMAN, Bull. Amer. Mus. Nat. Hist., vol. 31, 1912, p. 160, in text, part (Inca Mine, Peru; crit.).

Basileuterus luteoviridis signatus HELLMAYR, Arch. f. Naturg., vol. 85, A. 1919, p. 5, part (Chubnasi, Peru; crit.).—CHAPMAN, Proc. Biol. Soc. Washington, vol. 32, 1919, p. 265, in text, part (San Miguel Bridge and Torontoy, Peru; range; crit.); Bull. U. S. Nat. Mus., No. 117, 1921, pp. 14, 106, 107 (San Miguel Bridge and Torontoy, Peru; range; crit.).

Description.—Above olive citrine, the wings and tail externally somewhat brighter, more yellowish green; short superciliaries and suborbital spot amber yellow; transocular stripe dusky; under parts pale strontian yellow, the sides and flanks more or less shaded with yellowish citrine; under wing-coverts dull yellowish; bill brown; feet pale brownish (in skin).

Measurements.—Male (nine specimens): Wing, 60–65 (average, 62.5); tail, 57–64 (59.5); bill, 10–11.5 (11); tarsus, 23–23.5 (23.2)

Female (eight specimens) : Wing, 57–61 (59.5) ; tail, 55–59 (57) ; bill, 10–11 (10.7) ; tarsus, 22.5–23.5 (23).

Range.—Subtropical Zone, Andes of Peru, from Junin southward to the Urubamba Valley.

Remarks.—This form was described as a distinct species, but has been reduced to a subspecies of *B. luteoviridis* by Doctors Hellmayr and Chapman. It differs from *B. luteoviridis* in its markedly smaller size, much duller coloration throughout, and paler feet. Moreover, while *B. luteoviridis* is a representative form of the Temperate Zone in the Andes, *B. signatus* belongs to the Subtropical Zone. Both forms occur in the Urubamba Valley in Peru at their appropriate and respective elevations, as Doctor Chapman remarks. Convincing evidence of their specific distinctness is now forthcoming in the shape of perfectly typical examples of both which have been taken at Rumicruz, Junin, Peru, at an elevation of 9,700 feet, by one of the collectors for the American Museum of Natural History. The type specimen of *B. signatus*, now before me, was collected by Kalinowski at Idma, above Santa Ana, in the Urubamba Valley; it agrees well with the good series from Peru now available.

Specimens examined.—Peru: Idma, above Santa Ana, 1 (type); San Miguel Bridge, Urubamba Cañon, 6; Santa Rita, Urubamba Cañon, 4; Torontoy (7,800 feet), Urubamba Cañon, 2; Inca Mine, 2; Chelpes, Junin, 1; Rumicruz (9,700 feet), Junin, 3. Total, 19.

***BASILEUTERUS SIGNATUS FLAVOVIRENS*, new subspecies**

Basileuterus luteoviridis (sic) (not *Trichas luteoviridis* Bonaparte) ALLEN, Bull. Amer. Mus. Nat. Hist., vol. 2, 1889, p. 79 (Yungas, Bolivia).

Basileuterus signatus VON BERLEPSCH and STOLZMANN, Ornith., vol. 13, 1906, p. 74, part (Yungas, Bolivia).

Basileuterus luteoviridis signatus HELLMAYR, Arch. f. Naturg., vol. 85, A, 1919, p. 5, part (Cocapata, Bolivia).—CHAPMAN, Proc. Biol. Soc. Washington, vol. 32, 1919, p. 265, in text, part (Santo Domingo and Oconeque, Peru; Incachaca, Bolivia).—HELLMAYR, Arch. f. Naturg., vol. 90, A, 1924, p. 157, in text (Sandillani, Cocapata, and Chaco, Bolivia; meas.; crit.).

Type.—No. 85,882, Collection Carnegie Museum, adult male; Incachaca, Bolivia, October 13, 1921; José Steinbach.

Subspecific characters.—Similar to *Basileuterus signatus signatus*, but more richly colored throughout, the upper parts, wings, and tail much brighter (between warbler green and olive green); the superciliaries and under parts lemon chrome; and the transocular stripe darker and more distinct. "Iris brown; bill black, brown below basally; feet yellow.

Measurements.—Male: Wing, 59–63 (average, 60.5); tail, 53–59 (56.5); bill, 10.5–11.5 (11); tarsus, 21–24 (22.7). Female (seven

specimens): Wing, 55-60 (57.5); tail, 52-56 (54.5); bill, 10.5-11 (10.8); tarsus, 22-23 (22.3).

Range.—Subtropical Zone, Andes of Bolivia and extreme south-eastern Peru.

Remarks.—Attention has already been called to the peculiarities of Bolivian specimens of this species by Doctor Chapman, and now that we have a good series from both Bolivia and Peru for study it is obvious that they represent two well-marked forms respectively (except that examples from southeastern Peru belong to the Bolivian race). In the richness of its general coloration as compared with true *signatus* the new race approaches *B. luteoviridis striaticeps*, but is much smaller, and has paler feet.

A young bird in juvenal dress (No. 85,172, Collection Carnegie Museum), beginning to moult into the next plumage, is dull brownish olive, paler below.

Specimens examined.—Bolivia: Incachaca, 18; Yungas, 1. Peru: Oconeque, near Limbani, 1; Santo Domingo, 4. Total, 24.

BASILEUTERUS LUTEOVIRIDIS LUTEOVIRIDIS (Bonaparte)

Trichas luteoviridis BONAPARTE, Atti Sesta Riunione Sci. Ital. Milano, "1844," 1845, p. 405 ("Bogotá," Colombia; orig. descr.; type in coll. Antinori, fide Hellmayr).

Myiothlypis luteoviridis BONAPARTE, Consp. Avium, vol. 1, 1850, p. 311 ("Bogotá," Colombia; diag.).—SCLATER, Proc. Zool. Soc. London, 1855, p. 143 ("Bogotá," Colombia).

Chlorospingus xanthophrys SCLATER, Proc. Zool. Soc. London, 1856, pp. 30 ("Bogotá," Colombia; orig. descr.; type now in coll. Brit. Mus.), 93 (descr.; crit.).

Basilcuterus luteoviridis SCLATER and SALVIN, Proc. Zool. Soc. London, 1875, p. 234 (Merida, Venezuela), p. 235 (syn.).—SHARPE, Cat. Birds Brit. Mus., vol. 10, 1885, p. 379 ("Bogotá," Colombia; descr.; refs.).—SALVADORI and FESTA, Boll. Mus. Zool. ed Anat. comp. Torino, vol. 15, No. 357, 1899, p. 8 (Pun, Ecuador; crit.).—CHAPMAN, Bull. Amer. Mus. Nat. Hist., vol. 31, 1912, p. 160, in text, part ("Bogotá," Colombia).—HELLMAYR and VON SEILERN, Arch. f. Naturg., vol. 78, A, 1912, p. 47, in text (crit.).—CHAPMAN, Bull. Amer. Mus. Nat. Hist., vol. 36, 1917, p. 550 (Almaguer, Fómeque, and Subia, Colombia; Colombian range; crit.).

Basilcuterus luteoviridis luteoviridis CHAPMAN, Proc. Biol. Soc. Washington, vol. 32, 1919, p. 265, in text (Colombia).—HELLMAYR, Arch. f. Naturg., vol. 85, A, 1919, p. 5, in text ("Bogotá," Colombia; crit.).—CHAPMAN, Bull. Amer. Mus. Nat. Hist., vol. 55, 1926, p. 599 (Zuna, Tam-billo, and upper Sumaco, Ecuador; faunal range).

Description.—Above between olive green and warbler green, including the wings and tail externally; below wax yellow, with the chin paler, more whitish, and the crissum duller, the sides and flanks shaded with pyrite yellow or warbler green; short superciliaries mustard yellow, bordered above by a faint dusky greenish line; lores

and postocular spot dark olive gray; auricular region like the back; under wing-coverts yellowish white; bill black; feet pale brown (in skin).

Measurements.—Male (eight specimens): Wing, 68–76 (average, 72); tail, 60–69 (64); bill, 10.5–12 (10.8); tarsus, 20–21.5 (21). Female (two specimens): Wing, 65; tail, 59–62; bill, 11; tarsus, 20.5–21.

Range.—Humid Temperate Zone of the Andes, in Venezuela, Colombia, and Ecuador.

Remarks.—In its reduced ninth primary this species approaches *Myiothlypis* (in which, indeed, it was actually placed by Bonaparte in 1850), but otherwise is best referred to *Basileuterus*, although aberrant in coloration. It is most nearly related to *B. signatus* and *B. flaveolus*, but while these two are species of the Subtropical Zone and the Tropical Zone, respectively, *B. luteoviridis* (as a species) is rather more characteristic of the Temperate Zone of the Andean system. The typical race occupies the strip of Temperate Zone stretching from Venezuela and Colombia into Ecuador, on the upper slopes of the Andes.

Specimens examined.—Venezuela: Culata (3,000 m.), 1. Colombia: Paramo de Tama, 2; Choachi, Bogotá, 2; Fómeque, Bogotá, 1; Subia (1,900 m.), Cundinamarca, 1; Almaguer (10,300 feet), 3; "Bogotá," 4. Ecuador: Zuna (7,000 feet), Rio Upano, 3; Tambillo (8,000 feet), Rio Upano, 1; upper Sumaco, 1. Total, 19.

BASILEUTERUS LUTEOVIRIDIS STRIATICEPS (Cabanis)

Myiothlypis striaticeps CABANIS, Journ. f. Orn., vol. 21, 1873, p. 316 (Maraynioc, Peru; orig. descr.; type in coll. Berlin Mus.).

Myiothlypis luteoviridis (not *Trichas luteoviridis* Bonaparte) TACZANOWSKI, Proc. Zool. Soc. London, 1874, p. 509 (Maraynioc, Ninabamba, Sillapata, and Pumamarca, Peru).

Basileuterus luteoviridis TACZANOWSKI, Orn. Perou, vol. 1, 1884, p. 477, Tables, p. 29 (Maraynioc, Sillapata, and Ninabamba, Peru; descr.; refs.; habits).

Basileuterus luteoviridis striaticeps VON BERLEPSCH and STOLZMANN, Proc. Zool. Soc. London, 1896, p. 331 (Maraynioc and Garita del Sol, Peru; crit.).—VON BERLEPSCH and STOLZMANN, Orn. vol. 13, 1906, p. 75, in text (crit.).—CHAPMAN, Proc. Biol. Soc. Washington, vol. 32, 1919, p. 265, in text (crit.).—HELLMAYR, Arch. f. Naturg., vol. 85, A, 1919, 6, in text (crit.).

Basileuterus luteoviridis superciliaris CHAPMAN, Proc. Biol. Soc. Washington, vol. 32, 1919, p. 265 (above Torontoy [type locality] and the Cedrobamba, Peru; orig. descr.; type in coll. U. S. Nat. Mus.).—CHAPMAN, Bull. U. S. Nat. Mus., No. 117, 1921, pp. 33, 41, 106 (localities; descr., etc.).

Subspecific characters.—Similar in size and general coloration to *B. luteoviridis luteoviridis*, but superciliaries much wider and more distinct, as well as brighter yellow (empire yellow); lores and postocular spot darker (as in *B. signatus*).

Measurements.—Male (seven specimens): Wing, 71–76 (average, 73.5); tail, 61–70 (66.5); bill, 11–12.5 (11.7); tarsus, 23–25 (24). Female (four specimens): Wing, 64–67 (65.5); tail, 61–63 (61); bill, 11–12.5 (12); tarsus, 23–24 (23.5).

Range.—Temperate Zone, Andes of Peru.

Remarks.—A topotype of this form in the collection of the United States National Museum (No. 159,870) shows no trace of a dusky or blackish lateral crown-stripe, as called for in the original description, and on the absence of which Doctor Chapman mainly relied to distinguish his supposed race *superciliaris*. Of four specimens from the Warsaw Museum (two being topotypes), two have a trace of such a dark line above the yellow superciliaries, while the other two do not. This character would seem to have no geographical significance. With nine specimens of typical *striaticeps* now available for comparison with four of *superciliaris*, I now find that the only difference of moment between these two is the slightly brighter color of the upper parts in the latter—bright citrine instead of dark citrine. And as the series of true *luteoviridis* examined show an equally great range in variation in this respect, I should want to see a considerably larger series before finally accepting *superciliaris*. The smaller size, even if constant, could of itself scarcely serve to hold the form, in my opinion.

Doctor Chapman remarks that the narrowing of the green area on the crown, between the broad yellow superciliaries, is a step on the way toward *Myiothlypis nigrocristata*, and so indeed it would seem. In any study of the case the fact that *Myiothlypis* and *Basileuterus luteoviridis* sometimes occur together would have to be considered.

Specimens examined.—Peru: Maraynioc, 9; Sillapata, 1; Ninabamba, 1; above Torontoy (10,700 and 14,000 feet), 3 (including type of *B. luteoviridis superciliaris* Chapman); Cedrobamba (12,000 feet), Urubamba Cañon, 1; Rumicruz (9,700 feet), Junin, 2. Total, 17.

BASILEUTERUS RICHARDSONI Chapman

Basileuterus richardsoni CHAPMAN, Bull. Amer. Mus. Nat. Hist., vol. 31, 1912, p. 160 (Andes west of Popayan [type locality] and Laguneta, Colombia; orig. descr.; type in coll. Amer. Mus. Nat. Hist.); vol. 36, 1917, p. 550 (same localities; range; crit.).

Description.—Above, including the wings and tail externally, dull olive green; short superciliaries cream color; lores, eyelids, and postocular spot dark olive; sides of the head dull citrine drab; under parts wax yellow, more or less washed with olive lake, the chin paler, almost whitish, the sides and flanks shaded with yellowish citrine, the under wing-coverts grayish or greenish, the crissum duller (near olive ocher); “iris brown; bill black; feet brownish horn

or brownish yellow" (Carriker). Juvenal plumage (No. 70,242, Collection Carnegie Museum, August 27, 1918): above dark citrine, below similar but paler, amber yellow medially. The superciliaries are faintly indicated; the feet are pale, "yellowish flesh" in life.

Measurements.—Male (three specimens): Wing, 71–73 (average, 72); tail, 60–63 (62); bill, 11–13 (12); tarsus, 20–21 (20.3). Female (four specimens): Wing, 63–68 (65); tail, 56–62 (59); bill, 10–11 (10.8); tarsus, 20–21 (20.7).

Range.—Temperate Zone, Central and Western Andes of Colombia.

Remarks.—The above description is based on a pair of adult birds in the collection of the Carnegie Museum, taken on August 27 and 31, respectively. The type series in the American Museum collection are appreciably duller yellow below, but are not in such good condition. This form is quite distinct even from its nearest geographical ally, *B. luteoviridis*, their respective ranges overlapping in the Central Andes, but it is so remarkably similar to *B. signatus signatus* that it might well be regarded as conspecific were it not for its wide separation from the range of that form and its different zonal habitat. As compared with *B. signatus flavovirens*, it carries the characters of true *signatus* a step further, being still duller and paler.

Specimens examined.—Colombia: Sancudo, Caldas, 3; Coast Range west of Popayan (10,340 feet), 5 (including type). Total, 8.

BASILEUTERUS BIVITTATUS (Lafresnaye and D'Orbigny)

Muscicapa bivittata LAFRESNAYE and D'ORBIGNY, Syn. Avium, pt. 1, Mag. Zool., cl. ii, 1837, p. 51, part (Yungas, Bolivia; orig. descr. male; type in coll. Paris Mus.).

Trichas bivittatus LAFRESNAYE, Rev. Zool., 1840, p. 231 (diag.; ref. orig. descr.).

Muscicapara bivittata D'ORBIGNY, Voy. Amer. Mérid., Oiseaux, 1844, p. 324 (Carcuata [Yungas], and eastern cordillera of La Paz, Bolivia; descr.; habits).

Elania bivittata GRAY, Gen. Birds, vol. 1, 1847, p. 250 (in list of sp.; ref. orig. descr.).

Leptopogon bivittata BONAPARTE, Consp. Avium, vol. 1, 1850, p. 186 (ref. orig. descr.).

Basileuterus bivittatus BAIRD, Rev. Amer. Birds, 1865, p. 242 (diag.), p. 243, part (refs.), p. 245, in text, part (crit.).—SCLATER and SALVIN, Proc. Zool. Soc. London, 1879, p. 594 (Bolivian records and refs.).—VON BERLEPSCH, Journ. f. Orn., vol. 32, 1884, p. 283, note (crit.).—SHARPE, Cat. Birds Brit. Mus., vol. 10, 1885, p. 391, part (Simacu and Consata, Bolivia; Bolivian refs.).—SALVADORI, Boll. Mus. Zool. ed Anat. comp. Torino, vol. 12, No. 292, 1897, p. 4 (San Lorenzo, Jujuy, Argentina).—BRUCH, Rev. Mus. La Plata, vol. 11, 1904, p. 255 (Oran, Salta, Argentina).—VON BERLEPSCH, Ornith., vol. 14, 1907, p. 442 (syn.).—DARBENE, An. Mus. Nac. Buenos Aires, vol. 11, 1910, p. 369 (Argentine localities and refs.); Bol. Soc. Physis, vol. 1, 1914, p. 354 (Argentine records and refs.).

Basileuterus diachlorus (not of Cabanis) SCLATER and SALVIN, Proc. Zool. Soc. London, 1879, p. 594 (Simacu and Consata, Bolivia).

Basileuterus bivittatus bivittatus HARTERT and VENTURI, Nov. Zool., vol. 16, 1909, p. 167 (Ledesma [Jujuy] and Rio Bermejo [Salta], Argentina.—DINELLI, El Hornero, vol. 1, 1918, p. 61 (Tafi Viejo, Tucumán, Argentina; descr. nest and eggs).—HELLMAYR, Arch. f. Naturg., vol. 85, A, 1919, p. 6, in text (crit.); Nov. Zool., vol. 32, 1925, p. 181 (crit. on type, etc.).

Description.—Pileum with two black lateral stripes extending to the nape, and inclosing an oblong coronal spot which varies in color from Mars yellow to lemon chrome; a short transocular stripe dusky; short and narrow superciliaries and spot below the eye pale yellow; sides of the head and neck, hindneck (behind the vertical spot), and upper parts in general, dull warbler green to bright olive green, including wings and tail externally; under parts lemon chrome, the sides and flanks washed with pyrite yellow; under wing-coverts dull pyrite yellow; "iris brown; bill black; feet pale brownish yellow."

Measurements.—Male: Wing, 65–71 (average, 68); tail, 57–64 (60.5); bill, 11–12 (11.5); tarsus, 21.5–22.5 (22). Female: Wing, 61–67 (63.5); tail, 54–62 (58); bill, 11–11.5 (11); tarsus, 20.5–22.5 (21.5).

Range.—From southeastern Peru through central Bolivia (Yungas of Cochabamba), and south to the Province of Salta in Argentina, in the Tropical Zone.

Remarks.—*Basileuterus bivittatus* differs from *B. coronatus* in a direction exactly opposite from that of *B. fraseri*, for it lacks any gray color whatever in the plumage, being wholly greenish above and yellow below, while retaining the coronal spot, black lateral crown-stripes, and an indication of a dark transocular stripe. It thus leads off from the *B. coronatus* group in the direction of *Myiothlypis*, just as *B. fraseri* leads off toward *Euthlypis*. It appears to be in the main a Tropical Zone form, peculiar to the eastern foothills of the Andes of southeastern Peru and Bolivia, ranging thence to northern Argentina. It was discovered by D'Orbigny in Bolivia, and described as a *Muscicapa*, its real affinities remaining unrecognized until pointed out by Baird in 1865, although he had not seen a specimen. Doctor Hellmayr now finds that the example described as the female of this species by Lafresnaye and D'Orbigny is really a specimen of *Basileuterus flaveolus*, but fortunately this will not affect the names. Virtually the only variation observable in the series of specimens examined (all but five from Bolivia) is that affecting the color of the coronal spot, which runs from bright yellow to dull orange, and the extent and intensity of the black lateral crown-stripes.

Specimens examined.—Peru: Rio Inambari (2,200 feet), 3. Bolivia: Machareti, 1; Yacuiba, 5; Cerro Hosane, 9; Samaipata, 4;

Songo, Yungas, 1; Monos (4,700 feet), 2; Vermejo (3,500 feet), Santa Cruz, 6; Yungas of Cochabamba (3,600 feet), 1. Argentina: Ledesma, Jujuy, 2. Unspecified, 2. Total, 36.

BASILEUTERUS CHRYSOGASTER CHRYSOGASTER (von Tschudi)

Setophaga chrysogaster VON TSCHUDI, Arch. f. Naturg., vol. 10, 1844, p. 276 (Peru; orig. descr.; type in coll. Mus. Neuchâtel).—VON TSCHUDI, Fauna Peruana, Aves, 1844, p. 192 (Peru; descr.: range).

Basileuterus chrysogaster BAIRD, Rev. Amer. Birds, 1865, p. 242, note (diag.), p. 244, part (in list of species).—VON BERLEPSCH, Journ. f. Orn., vol. 32, 1884, p. 283, note (crit.).—VON BERLEPSCH and STOLZMANN, Orn. vol. 13, 1906, p. 107, in text (crit.).

Basileuterus diachlorus CABANIS, Journ. f. Orn., vol. 21, 1873, p. 316 (Amable Maria, Peru; orig. descr.; type in coll. Warsaw Mus.).—TACZANOWSKI, Proc. Zool. Soc. London, 1874, p. 509 (Monterico and Amable Maria, Peru).—SCLATER, Proc. Zool. Soc. London, 1883, p. 653, in text (syn.).—VON BERLEPSCH, Journ. f. Orn., vol. 32, 1884, p. 283, note (crit.).

Basileuterus bivittatus (not *Muscicapa bivittata* Lefresnaye and D'Orbigny) TACZANOWSKI, Orn. Perou, vol. 1, 1884, p. 473, excl. syn. part, Tables, p. 29 (Monterico and Amable Maria, Peru; descr.; refs.).—SHARPE, Cat. Birds Brit. Mus., vol. 10, 1885, p. 391, part (Monterico, Peru; descr.; refs.).—VON BERLEPSCH and STOLZMANN, Orn. vol. 13, 1906, p. 106 (Huaynapata, Peru; crit.).

Basileuterus bivittatus (lapsus) ALLEN, Bull. Mus. Comp. Zool., vol. 3, 1876, p. 353 (Coroico, Bolivia).

Basileuterus bivittatus chrysogaster VON BERLEPSCH and STOLZMANN, Proc. Zool. Soc. London, 1896, p. 331 (La Merced, Peru; crit.).—VON BERLEPSCH and HELLMAYR, Journ. f. Orn., vol. 53, 1905, p. 6 (crit. on type).—HELLMAYR, Arch. f. Naturg., vol. 85, A, 1919, p. 6 (Yahuarmayo, Peru; range; crit.); Nov. Zool., vol. 32, 1925, p. 181 (localities; range).

Description.—Pileum with two broad lateral stripes of dusky black, meeting in front and more or less overlaid with dull green, and inclosing a median coronal spot or streak of Mars yellow, overlaid by sulphine yellow; superciliaries and suborbital spot pale dull yellow; transocular streak dusky; upper parts in general between warbler green and olive green, the wings and tail externally similar but darker (near olive green); auricular region and sides of the neck like the back; under parts rich yellow (lemon chrome), the sides and flanks shaded with pyrite yellow; under wing-coverts dull yellow; bill and feet brownish (in skin).

Measurements.—Male (seven specimens): Wing, 61–66 (average, 63.5); tail, 52–55 (54); bill, 10–11 (10.8); tarsus, 18.5–21 (20). Female (eight specimens): Wing, 55–60 (57); tail, 48–51 (50); bill, 10.5–11 (10.8); tarsus, 17.5–20 (18.5).

Range.—Central Peru, from the Department of Junin southeastward to Lake Titicaca and the eastern boundary.

Remarks.—Forty years went by after von Tschudi had described this species before the true application of his name was pointed out

by von Berlepsch. and in the meantime it had received another name, from Cabanis. In 1905, after an examination of the type, Messrs. von Berlepsch and Hellmayr were able to confirm its claims to recognition as a race of *B. bivittatus*. The type specimen in question, now before me through the courtesy of the authorities of the Neuchâtel Museum, is in very poor condition—badly mangled and ruffled, with most of the bill gone, and the tail gone (all but one feather)—but clearly belongs to the same form as the series of fresh specimens in the collection of the American Museum of Natural History which have been studied in this connection. In addition I have handled most of the material on which Messrs. von Berlepsch and Hellmayr's remarks were based. With specimens of both *bivittatus* and *chrysogaster* coming from the same part of eastern Peru it is at once obvious that their respective ranges overlap at this point, and I can no longer follow these authorities in keeping them conspecific, but would rate them as distinct although closely allied species. Typical *B. chrysogaster* differs from *B. bivittatus* in its smaller size, duller olive green wings and tail, darker, more olive greenish sides of the head, and purer, richer yellow under parts. All of the specimens of *chrysogaster* examined have the coronal spot Mars yellow, while in the majority of those of *bivittatus* it is purer yellow.

The only locality mentioned by von Tschudi in connection with his description of this species is San Pedro, near Lurin. Doctor Hellmayr believes that this is a mistake, and has accordingly proposed to substitute Chanchamayo, in the Department of Junin, as the accepted type locality. The species is a forest-lover, and appears to belong to the Tropical Zone.

Specimens examined.—Peru: Huaynapata, Marcapata, 1; Amable Maria, 1; Monterico, 2; La Merced, Chanchamayo, 3; Callanga, Cuzco, 1; Lake Titicaca (probably=Coroico, Bolivia), 1; La Pampa, 2; Astillero, 1; Tulumayo (4,000 feet), Junin, 6; unspecified, 1 (the type). Total, 19.

BASILEUTERUS CHRYSOGASTER CHLOROPHRYS von Berlepsch

Basileuterus bivittatus chlorophrys VON BERLEPSCH, Ornith., vol. 14, 1907, p. 347 ("Quito," Ecuador, orig. descr.; type now in coll. Frankfurt Mus.).—MÉNÉGAUX, Mission Service Geog. Mes. Arc. Méridien Equat. Am. du Sud, vol. 9, 1911, p. B 73, excl. syn. (Ayuriquin, Ecuador; crit.).—CHAPMAN, Bull. Amer. Mus. Nat. Hist., vol. 36, 1917, p. 552 (Buenavista, Nariño, Colombia).—HELLMAYR, Arch. f. Naturg., vol. 85, A, 1919, p. 7, in text (Paramba, CachaJacu, and Lita, Ecuador; range; crit.); Nov. Zool., vol. 32, 1925, p. 181 (ref. orig. descr.; range).

Subspecific characters.—Similar to *Basileuterus chrysogaster chrysogaster*, but upper parts darker, more brownish green (near dark citrine); superciliaries duller, more greenish yellow; and under parts also duller yellow.

Measurements.—Male (three specimens): Wing, 60–63 (average, 62); tail, 44–50 (48); bill, 10–11 (10.5); tarsus, 18.5–20 (19). Female (two specimens): Wing, 55–57; tail, 46–47; bill, 9.5; tarsus, 18.5–19.

Range.—Humid Tropical Zone of southwestern Colombia and northwestern Ecuador.

Remarks.—Judging from the few specimens examined, this race appears to be a good one, its characters being a further extension of those of *B. c. chrysogaster* (as compared with *B. bivittatus*). It was described from two specimens of "Quito" make, but later records go to show that it does not range so high up, and I therefore propose to substitute Lita (altitude 3,000 feet), northwestern Ecuador, as the accepted type locality.

Specimens examined.—Ecuador: "Quito," 1 (coll. von Berlepsch); Lita, 2; Chimbo, 1. Colombia: Buenavista, Nariño (1,200 feet), 2. Total, 6.

BASILEUTERUS RORAIMAE Sharpe

Basileuterus roraimae SHARPE, Cat. Birds Brit. Mus., vol. 10, 1885, p. 392 (Mount Roraima and Merume Mts., Brit. Guiana; orig. descr.; type [not designated] in coll. Brit. Mus.).—SALVIN, Ibis, 1885, p. 203 (same localities); 1886, p. 500 (Mount Twék-quay, Brit. Guiana), p. 506 (range).—VON BERLEPSCH and STOLZMANN, Ornith., vol. 13, 1906, p. 106, in text (plum.).—PENARD, Vogels van Guyana, vol. 2, 1910, p. 489 (Mount Roraima, Brit. Guiana; descr.).—(?) BEEBE, Zoologica, vol. 2, 1919, p. 232 (Bartica District, Brit. Guiana).—CHUBB, Birds Brit. Guiana, vol. 2, 1921, p. 416, pl. 6, fig. 1 (Mount Roraima, Brit. Guiana; descr.; refs.).

Basileuterus bivittatus roraimae HELLMAYR, Nov. Zool., vol. 32, 1925, p. 181 (ref. orig. descr.; range).

Description.—Above, including wings and tail externally, dark citrine, a little clearer and purer on the nape and the sides of the head; crown with a coronal spot of Mars yellow, inclosed between two lateral stripes of velvety black, which are produced backward and expanded over the nape, inclosing here a smaller spot of citrine; superciliaries citrine, their lower edge, from the nostrils to over the eye, narrowly pale yellow; a dusky black stripe through the eye; edge of lower eyelid pale yellow; under parts in general wax yellow, the sides shaded with pyrite yellow; bill horn brown; feet pale (in skin).

Most of the specimens examined show citrine tipping to the feathers of the vertex, producing a veiled effect.

Measurements.—Male (four specimens): Wing, 68–71 (average, 70); tail, 60–62 (61); bill, 11–12.5 (12); tarsus, 20.5–22.5 (21.5). Female (four specimens): Wing, 62–66 (64); tail, 55–56 (55.8); bill, 10–11.5 (10.5); tarsus, 20–22 (21).

Range.—Highlands of British Guiana.

Remarks.—A handsome species, related to *B. bivittatus*, but with a paler bill, the coronal spot somewhat differently colored (always decidedly Mars yellow), and the upper parts with a brownish shade by comparison. It was one of Whiteley's discoveries on Mount Roraima, and most of the specimens extant were collected by him. The late Frederick V. McConnell also took specimens on Roraima, and more recently Mr. Beebe has reported it from the Bartica District, but I have not seen the specimens on which his record is based.

Specimens examined.—British Guiana: Mount Roraima (3,500 and 5,000 feet), 8.

BASILEUTERUS TACARCUNAE Chapman

Basileuterus tacarcunae CHAPMAN, Amer. Mus. Nov. No. 143, 1924, p. 6 (Mount Tacarcuna, Panama; orig. descr.; type in coll. Amer. Mus. Nat. Hist.), p. 7 (diag.; range).—GRISCOM, Amer. Mus. Nov. No. 280, 1927, p. 13, in text (crit.).

Description.—Pileum with two broad lateral stripes of black, reaching the nape, and inclosing a median stripe of ecru olive, becoming more yellowish (olive ocher) on the vertex; superciliaries and sides of the head in general ecru olive, except for a postorbital stripe of black; upper parts, and wings and tail externally, olive green; under parts barium yellow, paler and duller anteriorly, more or less shaded on the breast, sides, and flanks with yellowish citrine; tibiae and under wing-coverts similar; bill brown above, paler below; feet pale brown (in skin).

Measurements.—Male: Wing, 57–66 (average, 62.5); tail, 50–56 (53); bill, 10–11 (10.3); tarsus, 19–21 (20). Female (four specimens): Wing, 58–59 (58.5); tail, 50–51 (50.5); bill, 9–10.5 (9.8); tarsus, 19–20.5 (19.5).

Range.—Subtropical Zone, mountains of extreme eastern Panama.

Remarks.—The type series is uniform, and evidently represents a form which is specifically distinct from the *B. tristriatus* group of conspecies, although closely allied thereto. In its head pattern this species closely resembles *B. meridanus*, but the coronal stripe has more color; the upper parts are more decided olive green, and the lower parts more yellowish, less buffy—more as in *B. tristriatus auricularis*, from which it differs again in the color of the head markings. The discovery of a form with such a combination of characters in a region where we would naturally expect to find a connectant between *B. tristriatus daedalus* and *B. tristriatus melanotis* is surprising, to say the least, and suggests that "its characters express the results of complete and prolonged isolation," as Doctor Chapman remarks.

Specimens examined.—Panama: Tacarcuna (4,000–4,200 feet), 3; east slope Mount Tacarcuna (4,600 feet), 11 (including type). Total, 14.

BASILEUTERUS MERIDANUS Sharpe

Basileuterus bivittatus (not *Muscicapa bivittata* Lafresnaye and D'Orbigny)
 SCLATER and SALVIN, Proc. Zool. Soc. London, 1870, p. 780 (Merida,
 Venezuela).

Basileuterus meridanus SHARPE, Cat. Birds Brit. Mus., vol. 10, 1885, p. 387
 (Merida, Venezuela: orig. descr.; type in coll. Brit. Mus.).

Basileuterus tristriatus meridanus HELLMAYR, Proc. Zool. Soc. London,
 1911, p. 1092, in text (Merida, Cumbre de Valencia, "Caripé," and
 Bucarito, Venezuela; crit.).—HELLMAYR and VON SEILERN, Arch. f.
 Naturg., vol. 78, A, 1912, p. 47 (Cumbre de Valencia, San Esteban, Merida,
 and "Caripé," Venezuela; crit.).—HELLMAYR, Anz. Orn. Ges. Bayern,
 No. 6, 1922, p. 44, in text (range; crit.).—CHAPMAN, Amer. Mus. Nov.
 No. 143, 1924, p. 4 (range), p. 7 (diag.; El Liman, Venezuela).—
 HELLMAYR, Arch. f. Naturg., vol. 90, A, 1924, p. 158, in text (Cumbre de
 Valencia, Merida, and Bucarito, Venezuela; range; crit.).

Basileuterus tristriatus bessereri HELLMAYR, Anz. Orn. Ges. Bayern, No. 6,
 1924, p. 44 (Silla de Caracas [type locality] and Galipán, Venezuela;
 orig. descr.; type in coll. Zool. Mus. Munich).—CHAPMAN, Amer. Mus.
 Nov. No. 143, 1924, p. 4 (range), p. 7 (diag.; Cotiza, Galipán, and Silla
 de Caracas, Venezuela), p. 8 (meas.).—HELLMAYR, Arch. f. Naturg.,
 vol. 90, A, 1924, p. 158 (Galipán and Silla de Caracas, Venezuela; range;
 crit.).

Description.—Pileum with two broad lateral stripes of black, reaching the nape, and inclosing a median stripe of dull citrine, becoming slightly more yellowish (ecru olive) on the vertex; narrow superciliaries dull citrine, more buffy anteriorly; postocular streak and small spot before the eyes black; auricular and suborbital regions dull citrine to buffy citrine; upper parts, and wings and tail externally, dark citrine; under parts pale yellow (primrose yellow), more or less washed or shaded with buffy on the breast, and with dull citrine on the flanks; under wing-coverts dull yellowish; "iris brown; bill black above, pale horn-color below; feet dusky yellow" (Carriker).

Measurements.—Male: Wing, 58–63 (average, 60.5); tail, 51–56 (54.5); bill, 9.5–10.5 (10); tarsus, 19.5–21 (20.5). Female: Wing, 54–61 (57); tail, 51–56 (52.5); bill, 9.5–10.5 (10); tarsus, 19–21 (20).

Range.—Subtropical Zone, Andes of Merida and Coast Range, Venezuela.

Remarks.—I am inclined to keep this form specifically distinct from *B. tristriatus*, although its close relationship thereto may be admitted. Its reduced auricular spot (even smaller than in *B. tristriatus melanotis*), inconspicuous superciliaries, narrowed black lateral crown-stripes, and lack of a decided vertical spot give it a different look from *B. tristriatus* in any of its several forms. It shows no trace of punctate markings below, as do the connecting races of *B. tristriatus*, neither does it intergrade therewith through individual variation.

Doctor Hellmayr has described the bird from the region of Caracas as a new form, *bessereri*, on the ground of paler coloration as compared with typical *meridanus* from Merida and Cumbre de Valencia. The series studied in this connection do not seem to bear out the distinction. There is a slight average difference between birds from the coast range and those from the Merida region, but it is so slight and so inconstant, and perhaps in part seasonal, that I think it is not worth while recognizing by name.

Specimens examined.—Venezuela: La Cumbre de Valencia, 10; Guarico, 3; Anzoategui, 1; Silla de Caracas, 2; Guamito, 9; Heights of Tabay, 1; Puerto Cabello (?), 2; Merida, 2; Galipán, 1; Cotiza, Caracas, 6; El Liman, Valley of Puerto La Cruz, 1; Culata, 1. Total, 39.

BASILEUTERUS TRISTRIATUS PUNCTIPECTUS Chapman

Basileuterus bivittatus (not *Muscicapa bivittata* Lafresnaye and D'Orbigny) SCLATER and SALVIN, Proc. Zool. Soc. London, 1879, p. 594, part (Simacu, Yungas, Bolivia).

Basileuterus auricularis SHARPE, Cat. Birds Brit. Mus., vol. 10, 1885, p. 386, part (Simacu, Bolivia).

Basileuterus tristriatus (not *Myiodioctes tristriatus* von Tschudi) ALLEN, Bull. Amer. Mus. Nat. Hist., vol. 2, 1889, p. 79 (Mapiri, Bolivia).

Basileuterus tristriatus tristriatus CHAPMAN, Bull. Amer. Mus. Nat. Hist., vol. 36, 1917, p. 551, part (Inca Mine, Peru; crit.).

Basileuterus tristriatus punctipectus CHAPMAN, Amer. Mus. Nov. No. 143, 1924, p. 5 (Yungas, Cochabamba, Bolivia; orig. descr.; type in coll. Amer. Mus. Nat. Hist.), p. 7 (Locotal, Incachaca, Roquefajda, Yungas, and Mapiri, Bolivia; Santo Domingo, Peru), p. 8 (meas.).

Subspecific characters.—Similar to *Basileuterus tristriatus tristriatus*, but obviously darker above (nearer olive citrine); the light stripes on the head paler, olive buff; the under surface paler, straw yellow, and conspicuously although obscurely spotted with dusky olive.

Measurements.—Male: Wing, 59–67 (average, 62); tail, 52–56 (54.5); bill, 9.5–10.5 (10); tarsus, 19.5–20.5 (20). Female (seven specimens): Wing, 56–61 (59); tail, 47–53 (50); bill, 9.5–10.5 (10); tarsus, 19–20 (19.5).

Range.—Subtropical Zone, Andes of Bolivia and southeastern Peru.

Remarks.—A series of *Basileuterus* sent in to the Carnegie Museum from Bolivia a few years ago were recognized as a probably new form of the *B. tristriatus* group, but without typical material for comparison they could not be properly characterized at the time. Moreover, in view of Doctor Chapman's remarks on specimens from Inca Mine, Peru, as compared with those from the Colombian Andes, it seemed wise to go slowly. In the meantime, however, Doctor

Chapman had succeeded in securing specimens of typical *tristriatus*, and was led to describe the Bolivian bird under the above appropriate name. It is certainly very different from true *tristriatus*, as he pointed out, more nearly resembling the form of the Eastern Andes, *B. t. auricularis*, than which it is much duller and paler below, with more spotting, and slightly duller green above. The color of the under parts is much closer, indeed, to that of *B. t. daedalus*, but is more yellowish and not so decidedly buffy, with decided spotting; the upper surface is more olivaceous, less brownish. It is paler below than *B. t. melanotis*, with more spotting; the median crown-stripe is tinged with yellow, not orange brown.

This form seems to be a distinct development of the *B. tristriatus* group, marking its southernmost extension in the Andes. Doctor Chapman remarks on the characters separating it from *tristriatus* proper, with which it shows no sign of direct intergradation, although close to it geographically. He keeps it as a race of the latter mainly because of its closer resemblance to the Colombian forms, whose racial relationship to *tristriatus* is sufficiently obvious, but intergradation with these would appear to be a geographical impossibility, and it is a question whether *punctipectus* had not better stand as a species by itself. All its characters, however—even the spotted breast—are merely modifications of those of *tristriatus* and not new developments. Two specimens from Inca Mine, Peru, and two from Santo Domingo, Peru (in the collection of the American Museum of Natural History), I refer to *punctipectus* provisionally, but they are not typical, lacking as they do in large measure the characteristic spotting below. They may possibly represent an intergrading race. Seven specimens in the von Berlepsch collection from Bolivia (Chaco, Quebrada Honda, and San Jacinto) are different again, not only lacking the spotting for the most part but also being more brightly colored below. More material is requisite to determine the status of the birds of these regions.

Our specimens are marked "iris brown; bill brownish black above, bone white below; feet light brown."

Specimens examined.—Peru: Inca Mine, 2; Santo Domingo, 2. Bolivia: Chaco, Yungas, 2; Quebrada Honda, 3; San Jacinto, 1; Samaipata, 1; Incachaca, 6; Yungas de Cochabamba, 6; Locotal (5,800 feet), Cochabamba, 4 (including type); Roquefalta, 3, Mapiri, 1; unspecified, 2. Total, 33.

BASILEUTERUS TRISTRIATUS TRISTRIATUS (von Tschudi)

Myiodiocytes tristriatus VON TSCHUDI, Arch. f. Naturg., vol. 10, 1844, p. 283 (Peru; orig. descr.; type in coll. Mus. Neuchâtel); Fauna Peruana, Aves, 1845-6, p. 193 (Peru; descr.).

Basileuterus tristriatus BONAPARTE, Conspectus Avium, vol. 1, 1850, p. 314 (in list of species.)

Basileuteurus tristriatus TACZANOWSKI, Orn. Perou, vol. 1. 1884, p. 472, Tables, p. 29, excl. syn. part (Auquimarca and Ropaybamba, Peru; descr.; crit.).—VON BERLEPSCH and STOLZMANN, Proc. Zool. Soc. London, 1902, p. 58 (Auquimarca and Ropaybamba, Peru).—VON BERLEPSCH and HELLMAYR, Journ. f. Orn., vol. 53, 1905, p. 7 (crit. on type).—VON BERLEPSCH and STOLZMANN, Ornis, vol. 13, 1906, p. 107 (Rio Cadena and Huaynapata, Peru).—CHAPMAN, Bull. U. S. Nat. Mus., No. 117, 1921, p. 107 (Idma, Peru; range).

Basileuterus tristriatus tristriatus HELLMAYR, Proc. Zool. Soc. London, 1911, part (crit. on type).—CHAPMAN, Amer. Mus. Nov. No. 143, 1924, pp. 4, 5, 6, 7 (Idma, Utcuyacu, Chelpes, and Chanpe, Peru; Sabanilla, Ecuador; range; crit.), p. 8 (meas.).—CHAPMAN, Bull. Amer. Mus. Nat. Hist., vol. 55, 1926, p. 599 (Sabanilla, Ecuador; range).

Description.—Pileum and nape with two broad lateral stripes of black, inclosing a narrower median stripe of deep olive buff, which is strongly tinged with pinard yellow on the vertex; conspicuous superciliaries, suborbital spot, and postauricular stripe deep olive buff; lores and auricular region black; upper parts, including the wings and tail externally, dark citrine; under parts lemon yellow, the sides and flanks shaded with pyrite yellow, the breast faintly and obscurely mottled with the same color, and the chin and maxillary region pale olive buff, sometimes with a faintly indicated maxillary stripe of dusky; under wing-coverts dull greenish white; bill and feet brownish (in skin).

Measurements.—Male (seven specimens): Wing, 61–68 (average, 65.5); tail, 50–60 (56); bill, 10–11 (10.7); tarsus, 20–22 (21). Female (six specimens): Wing, 60–65 (62); tail, 52–55 (53); bill, 10.5–11 (10.5); tarsus, 19–21.5 (20.5).

Range.—Subtropical Zone, Andes of Peru, south to the Urubamba Valley, and north to the Zamora Valley, southern Ecuador.

Remarks.—The only locality mentioned by von Tschudi in connection with this species is the plantation San Pedro, near Lurin, in the coast region of Lima, but this must have been a mistake, as Doctor Hellmayr points out, since the bird is clearly one of the Subtropical Zone. The word "citrongelb" used in the description seems to indicate the present race, which is the most brightly colored of all. Doctor Hellmayr, who has examined von Tschudi's type, says that it agrees with "Bogotá" skins, and with a male from Machay, Ecuador. The latter is referable to *B. tristriatus baezae*, while some "Bogotá" specimens approach this race. The type specimen in question, courteously placed at my disposal by the authorities of the Neuchâtel Museum, has faded somewhat, but is still yellower below than birds from eastern Ecuador. Two specimens in the Warsaw Museum from Ropaybamba and Auquimarca, respectively, and which were mounted at one time, have faded so as to be scarcely distinguishable from *baezae*. Three skins from Chinchao, Peru, are

obviously duller below than the rest of the series and are, in fact, close to *baezae*, but have whiter upper throats. They may represent a slightly differentiated local race.

Specimens examined.—Peru: Idma (5,000 feet), 4; Chaupe (6,100 feet), 3; Utcuyacu (4,800 feet). Junin, 4; Chelpes (7,300 feet), Junin, 5; Chinchao (5,700 feet), 3; Ropaybamba, 1; Auquimarca, 1; Santa Rosa (3,900 feet), Lower Marañon Valley, 1; Lomo Santo (5,000 feet), Lower Marañon Valley, 1; San Felipe (5,900 feet), Rio Huanacabamba, 1; unspecified, 1 (the type). Ecuador: Sabanilla (5,700 feet), Rio Zamora. Loja, 2. Total, 27.

BASILEUTERUS TRISTRIATUS BAEZAE Chapman

Basileuterus tristriatus (not *Myiodytes tristriatus* von Tschudi) TACZANOWSKI and VON BERLEPSCH, Proc. Zool. Soc. London. 1885, pp. 68, 74 (Machay and Mapoto, Ecuador).—SHARPE, Cat. Birds Brit. Mus., vol. 10, 1885, p. 385, excl. syn. (same localities; descr.).

Basileuterus tristriatus baezae CHAPMAN, Amer. Mus. Nov. No. 143, 1924, p. 5 (Baeza [type locality] and Macas, Ecuador; orig. descr.; type in coll. Amer. Mus. Nat. Hist.), p. 7 (Baeza, lower Sumaco, and Macas region, Ecuador), p. 8 (meas.); Bull. Amer. Mus. Nat. Hist., vol. 55, 1926, p. 600 (same localities; reprint orig. descr.; refs.).

Subspecific characters.—Similar to *Basileuterus tristriatus tristriatus*, but yellow tinge of median crown-stripe averaging darker, and yellow of under parts duller (between pinard yellow and picric yellow), and with more dark shading or mottling, giving a generally darker and duller effect in series when compared.

Measurements.—Male (eight specimens): Wing, 62–67 (average, 65); tail, 52–58 (55); bill, 10–11.5 (10.5); tarsus, 20–23 (21.5). Female (eight specimens): Wing, 61–67 (62.5); tail, 50–54 (52); bill, 10–11 (10.5); tarsus, 20–20.5 (20.3).

Range.—Subtropical Zone, Andes of eastern Ecuador.

Remarks.—This race is intermediate in its characters between true *tristriatus* and *auricularis*, but since it has a distinct range of its own it is well entitled to separate consideration. The specimens taken at Machay and Mapoto by M. Stolzmann over 40 years ago belong here, but the form was characterized from a series of freshly collected skins received by the American Museum from the Sumaco region of eastern Ecuador.

Specimens examined.—Ecuador: Baeza, 7; lower Sumaco, 8; San José de Sumaco, 1; Macas region, 1. Total, 17.

BASILEUTERUS TRISTRIATUS AURICULARIS Sharpe

Basileuterus bivittatus (not *Muscicapa bivittata* Lafresnaye and D'Orbigny) SALVIN, Cat. Coll. Strickland. 1882, p. 94, excl. syn. ("Bogotá," Colombia).

Basileuterus tristriatus (not *Myiodiocetes tristriatus* von Tschudi) VON BERLEPSCH, Journ. f. Orn., vol. 32, 1884, p. 283 (Bucaramanga and "Bogotá," Colombia; crit.).

Basileuterus auricularis SHARPE, Cat. Birds Brit. Mus., vol. 10, 1885, p. 386, part ("Bogotá," Colombia; orig. descr.; type [not designated] in coll. Brit. Mus.).

Basileuterus tristriatus tristriatus HELLMAYR, Proc. Zool. Soc. London, 1911, p. 1091, part ("Bogotá," Colombia; crit.).—CHAPMAN, Bull. Amer. Mus. Nat. Hist., vol. 36, 1917, p. 551, part (La Candela, La Palma, San Agustín, and Fusugasuga, Colombia; crit.).

Basileuterus tristriatus auricularis CHAPMAN, Amer. Mus. Nov. No. 143, 1924, p. 4 (Colombia; crit.), p. 7, part (diag.; range; Andes of Colombia), p. 8 (meas.).

Subspecific characters.—Similar to *Basileuterus tristriatus baezae*, but still paler and duller below (between baryta yellow and Martius yellow), with the darker flammulation on the breast more pronounced; yellow of median crown-stripe paler and less in evidence.

Measurements.—Male: Wing, 62–68 (average, 67); tail, 55–60 (58); bill, 10–11 (10.5); tarsus, 19–21 (20). Female (four specimens): Wing, 60–64 (62); tail, 52–57 (55); bill, 10–11 (10.5); tarsus, 19–20.5 (20).

Range.—Subtropical Zone, Eastern Andes and eastern slope of Central Andes, Colombia.

Remarks.—When Sharpe described this form he must have compared it with specimens from eastern Ecuador which he believed represented *B. tristriatus*, but which we now know really belong to a different race, *B. t. baezae*. Under his new form he placed specimens from three different localities, "Bogotá," Colombia, Pallatanga, Ecuador, and Simacu, Bolivia, failing to discriminate among them, whereas the present study has shown that specimens from the localities in question represent as many different races. Unfortunately he did not designate a type, but Doctor Chapman has by implication already restricted the type locality to "Bogotá," Colombia, which designation is acceptable. With more ample material at his command than any previous author, he has shown that *auricularis* is a perfectly valid and easily recognizable race, although Doctor Hellmayr, writing in 1911, did not see how it could be maintained. With Doctor Chapman's conclusions my own agree, after handling the same material he had before him and considerable in addition, and I would even go further than he did and separate the birds from the Western Andes under another name, as shown beyond.

Specimens examined.—Colombia: Las Ventanas, 5; Cachiri, 1; Rio Negro, 1; Boca del Monte, 2; "Bogotá," 6; near San Agustín (5,000 feet), Huila, 1; La Palma (5,000 feet), Huila, 1; La Candela (6,500 feet), Huila, 3; Aguadita, above Fusugasuga (6,500 feet), 1. Total, 21.

BASILEUTERUS TRISTRIATUS DAEDALUS Bangs

Basileuterus bivittatus (not *Muscicapa bivittata* Lafresnaye and D'Orbigny) SOLATER, Proc. Zool. Soc. London, 1859, p. 137, excl. syn. (Pallatanga, Ecuador); 1860, p. 85 (Cachi-Llacta and Nanegal, Ecuador); 1865, p. 285, excl. syn. part (diag.; Ecuador, in range).—HEINE and REICHENOW, Nom. Mus. Heineani Orn., 1882, p. 13 (Cachi-Llacta, Ecuador).

Basileuterus tristriatus (not *Myiodioctes tristriatus* von Tschudi) von BERLEPSCH and TACZANOWSKI, Proc. Zool. Soc. London, 1884, p. 286 (Cayandeled, Pedregal, and El Placer, Ecuador; crit.).—MÉNÉGAUX, Mission Service Geog. Mes. Arc Méridien Equat. Amer. du Sud, vol. 9, pt. 1, 1911, p. B 72 (Mindo and Quito, Ecuador; Ecuadorean records [part]).—LÖNNBERG and RENDAHL, Ark. f. Zool., vol. 14, No. 25, 1922, p. 78 (Mindo and road to Nanegal, Ecuador).

Basileuterus auricularis SHARPE, Cat. Birds Brit. Mus., vol. 10, 1885, p. 386, part (Pallatanga, Ecuador).—SALVADORI and FESTA, Boll. Mus. Zool. ed Anat. comp. Torino, vol. 15, No. 357, 1899, p. 9 (Gualea, Ecuador; Ecuadorean references).—GOODFELLOW, Ibis, 1901, p. 315 (Gualea and Canzacota, Ecuador).

Basileuterus melanotis daedalus BANGS, Proc. Biol. Soc. Washington, vol. 21, 1908, p. 160 (San Antonio, Rio Cali, western Colombia; orig. descr.; type in coll. Mus. Comp. Zool.).

Basileuterus tristriatus tristriatus HELLMAYR, Proc. Zool. Soc. London, 1911, p. 1091, part (Pueblo Rico, Colombia; crit.), p. 1212 (range).—CHAPMAN, Bull. Amer. Mus. Nat. Hist., vol. 36, 1917, p. 551, part (La Frijolera, Las Lomitas, San Antonio, Gallera, Cerro Munchique, Miraflores, and Salento, Colombia, crit.).

Basileuterus tristriatus auricularis CHAPMAN, Amer. Mus. Nov. No. 143, 1924, p. 4, part (Colombia; crit.), p. 7, part (diag.; range; W. Andes of Colombia; Gualea, Ecuador).—CHAPMAN, Bull. Amer. Mus. Nat. Hist., vol. 55, 1926, p. 600 (Chanchan and Chiguaneay Rivers and Gualea, Ecuador; Ecuadorean records; range).

Subspecific characters.—Similar to *Basileuterus tristriatus auricularis*, but under parts decidedly duller and paler, more buffy, less yellowish; the wings and tail more brightly colored.

Measurements.—Male: Wing, 61–67 (average, 64.5); tail, 51–57 (54.5); bill, 10–11.5 (10.5); tarsus, 20–21.5 (21). Female: Wing, 57–63 (60.5); tail, 48–54 (51); bill, 9.5–10.5 (10); tarsus, 20–21 (20.5).

Range.—Subtropical Zone, Western Andes of Colombia and western slope of the Andes of Ecuador.

Remarks.—Early records for this form were placed under *Basileuterus bivittatus* by mistake. Most later records were placed under *B. tristriatus* and *B. auricularis*. In 1908 Mr. Bangs gave the name *daedalus* to the bird of western Colombia, comparing it with *B. melanotis* of Costa Rica and calling it a subspecies of that form. Doctor Hellmayr, however, writing in 1911, still could find no difference between birds from western Colombia on the one hand and those from "Bogotá," Ecuador, and Peru on the other, and unhesitatingly placed them all with *B. tristriatus*. It remained for Doctor Chap-

man to show that the Colombian bird, to which Sharpe had applied the name *auricularis*, is easily distinguished from the much more brightly colored true *tristriatus*, but even he did not discriminate between the birds from the Eastern Andes on the one hand and those from the Central (western slope) and Western Andes on the other. With considerably more and much better material than he handled I find that the latter differ as above said, being conspicuously duller and paler below—straw yellow, the crissum decidedly buffy, the flanks much duller, ecru olive. The edgings of the wings and tail are also nearer orange citrine, instead of dark citrine.

Four specimens from western Ecuador in the collection of the Warsaw Museum bear on their labels an unpublished manuscript name in M. Stolzmann's hand, showing that he was long ago aware of their distinctness.

No. 134,101, Collection American Museum of Natural History, La Frijolera, Colombia, now before me, is indistinguishable from typical *tristriatus*, and Doctor Chapman suggests that it may be a mutant. It is odd to find an individual with the characters of another and very different form turning up within the range of an ally.

No. 67,312, Collection Carnegie Museum, June 21, is in juvenal dress, which is much duller and more uniform throughout than in the adult, with the pileum colored like the back. Two others taken June 19 are a little further along, and have acquired the crown-stripes.

Specimens examined.—Colombia: Heights of Caldas, 1; Bitaco Valley, 9; La Cumbre, 6; La Frijolera, 1; Las Lomitas, 2; San Antonio, 9 (including type); Gallera, 2; Cerro Munchique, 1; Miraflores, 5; Salento, 2; El Roble, 3; Cocal, 1; La Maria, Dagua Valley, 2; near Pavas, 1. Ecuador: Junction Chanchan and Chiguanecay Rivers, 1; Gualea, 1; Pedregal, 2; El Placer, 1; Cayandedel, 2. Total, 52.

BASILEUTERUS TRISTRIATUS CHITRENSIS Griseom

Basileuterus tristriatus chitrensis GRISCOM, Amer. Mus. Nov. No. 280, 1927, p. 13 (Chitrá, 4,000 feet, W. Panama; type in coll. Amer. Mus. Nat. Hist.).

Subspecific characters.—Similar to *Basileuterus tristriatus melanotis*, but under surface deeper, more greenish yellow, especially on the throat and breast.

Measurements.—Male (three specimens): Wing, 60, 63, 68; tail, 53, 54, 60; bill, 11, 11, 11.5; tarsus, 20, 20, 22. Female (three specimens): Wing, 58, 58, 60; tail, 50, 51, 54; bill, 10.5, 11, 11; tarsus, 20, 20.5, 20.5.

Range.—Subtropical Zone of Veragua, western Panama.

Remarks.—The generally deeper tone of the under parts serves to distinguish this race from its nearest ally, *B. t. melanotis* of Costa Rica and Chiriqui. It occupies the easternmost extension of the mountain ridge of western Panama, just before this breaks down at the Isthmus, and in its characters suggests an approach to *B. tacarcunae* of eastern Panama, as remarked by the describer.

Specimens examined.—Panama: Chitrá (4,000 feet), Veraguas, 6.

BASILEUTERUS TRISTRIATUS MELANOTIS Lawrence

Basileuterus melanotis LAWRENCE, Ann. Lyc. Nat. Hist. N. Y., vol. 9, 1868, p. 95 (Cervantes [type locality] and Birris, Costa Rica; orig. descr.; type in coll. U. S. Nat. Mus.).—SALVIN, Ibis, 1869, p. 313 (crit.); 1870, p. 108 (Veragua; crit.).—VON BERLEPSCH, Journ. f. Orn., vol. 32, 1884, p. 283, note (crit.).—SHARPE, Cat. Birds Brit. Mus., vol. 10, 1885, p. 386 (Costa Rica and Cordillera del Chucu, Veragua; descr.; refs.).—BANGS, Proc. New England Zool. Club, vol. 3, 1902, p. 60 (Boquete and Volcan de Chiriqui, Panama).—RIDGWAY, Bull. U. S. Nat. Mus., No. 50, vol. 2, 1902, p. 752 (descr.; range; refs.).—CARRIKER, Ann. Carnegie Mus., vol. 6, 1910, p. 795 (Costa Rican localities and refs.; habits).

Basileuterus bivittatus (not of Lafresnaye and D'Orbigny) SALVIN, Ibis, 1870, p. 108, part (crit.); Proc. Zool. Soc. London, 1870, p. 183 (Cordillera del Chucu, Veragua).—SALVIN and GODMAN, Biol. Centr.-Amer., Aves, vol. 1, 1881, p. 170, part, excl. extralimital localities and refs. (Cervantes and Birris, Costa Rica; Cordillera del Chucu, Panama; descr.; crit.).

Basileuterus bivittatus melanotis ZELEDON, An. Mus. Nac. Costa Rica, vol. 1, 1887, p. 107 (Costa Rica).

Basileuterus tristriatus melanotis HELLMAYR, Proc. Zool. Soc. London, 1911, pp. 1092, 1212 (range).—CHAPMAN, Amer. Mus. Nov. No. 143, 1924, p. 4 (range), p. 7 (diag.; Aquinares and Cartago, Costa Rica; Chiriqui, Panama).

Subspecific characters.—Similar to *Basileuterus tristriatus daedalus*, but upper parts darker, more olive green; under parts averaging more greenish yellow, less buffy; black on the sides of the head more restricted, the lower part of the auriculars and most of the lores being buffy.

Measurements.—Male: Wing, 57–67 (average, 62.5); tail, 50–57 (54); bill, 9–10.5 (10); tarsus, 20–21.5 (20.8). Female (eight specimens): Wing, 58–64 (60); tail, 51–58 (53.5); bill, 9.5–10.5 (10); tarsus, 19–21 (20.4).

Range.—Subtropical Zone, highlands of Costa Rica and western Panama.

Remarks.—This form is certainly closely related to the South American *Basileuterus tristriatus* group, so closely indeed that in spite of the fact that it can not intergrade geographically, either directly or indirectly, with any of the forms of that group (since, being

a bird of the Subtropical Zone, its range is cut off at Panama by the low country), I am inclined to follow Doctors Hellmayr and Chapman in according it only subspecific rank, for the present at least. It was described by Lawrence from a Costa Rican specimen collected by Carmiol, and later discovered in Veragua by Arcé, the receipt of whose specimens led Salvin to identify it with the *Basileuterus bivittatus* of Lafresnaye and D'Orbigny, with which it of course has nothing to do. Mr. Carriker says that in Costa Rica it is rather a rare bird, "the least common of the genus," which will account for its not being common in collections.

Specimens examined.—Costa Rica: Aquinares, 2; La Hondura, 4; Juan Viñas, 1; La Estrella de Cartago, 1; Birris, 1; Cervantes, 1 (type); Santa Maria de Dota, 1; Coliblanco, 2; Azahar de Cartago, 2; Escazú, 1. Panama: Boquete, 8; Volcano Chiriqui, 5. Total, 29.

BASILEUTERUS TRIFASCIATUS TRIFASCIATUS Taczanowski

Basileuterus trifasciatus TACZANOWSKI, Proc. Zool. Soc. London, 1880, p. 191 (Callacate, Peru; orig. descr.; type formerly in coll. Warsaw Mus.); Orn. Perou, vol. 1, 1884, p. 473, Tables, p. 29 (Callacate and Paucal, Peru; descr.; habits).—SHARPE, Cat. Birds Brit. Mus., vol. 10, 1885, p. 388, part (refs.; crit. on type).

Basileuterus trifasciatus trifasciatus CHAPMAN, Amer. Mus. Nov. No. 143, 1924, p. 8, in text (Palumbra, Peru; crit.).

Description.—Pileum with two black lateral stripes inclosing a median stripe of grayish olive, more or less tinged with olive yellow; superciliaries and sides of the head smoke gray, with a dusky transocular stripe; upper parts Roman green, lighter and purer (serpentine green) on the rump, the wings and tail similar, but more grayish anteriorly; under parts empire yellow, duller on the breast, and fading into buffy whitish on the upper throat and chin, the sides with some slight greenish shading; under wing-coverts yellowish white; "bill brown, the lower mandible paler; feet flesh-color; iris almost black" (Stolzmann).

Measurements.—Male (six specimens): Wing, 56–60 (average, 57); tail, 50–53 (51.5); bill, 10–11 (10.5); tarsus, 20–21 (20.8). (No females measured.)

Range.—Subtropical Zone, Andes of northern Peru.

Remarks.—This species has until lately been known only from the single pair of birds collected by M. Stolzmann at Callacate, in northern Peru, and from alcoholic examples in the Raimondi collection. Unfortunately enough, the types were among those which were lost at the time of the attempted transfer of all such material in the Warsaw Museum to Russia during the World War, as I am advised by M. Stolzmann himself. Doctor Chapman thinks that his examples

from Palambla, Piura, are probably typical, and the above description has been drawn up from these. The form shows affinities on the one hand to the *meridanus-tristriatus* group, and on the other to the *auricapillus* group, and in a linear sequence should probably be placed between these two.

Specimens examined.—Peru: Palambla (3,900–6,500 feet), Piura, 6.

BASILEUTERUS TRIFASCIATUS NITIDIOR Chapman

Basileuterus trifasciatus (not of Taczanowski) SHARPE, Cat. Birds Brit. Mus., vol. 10, 1885, p. 388, part (Jima, Ecuador; descr.).

Basileuterus trifasciatus nitidior CHAPMAN, Amer. Mus. Nov. No. 143, 1924, p. 8 (El Chiral [type locality], La Puente, Zaruma, Punta Santa Ana, Lumaná, Las Piñas, San Bartolo, Loja, Alamor, Guachanama, Celica, Guainche, and Cebollal, Ecuador; orig. descr.; type in coll. Amer. Mus. Nat. Hist.).—CHAPMAN, Bull. Amer. Mus. Nat. Hist., vol. 55, 1926, p. 600 (Ecuador localities; diag.; range).

Subspecific characters.—Similar to *Basileuterus trifasciatus trifasciatus*, but yellow of under parts richer and purer, throat more yellowish, and upper parts, etc., brighter green, with less grayish suffusion.

Measurements.—Male: Wing, 53–60 (average, 57); tail, 48–52 (50.5); bill, 9.5–10.5 (10); tarsus, 18.5–20 (19.5). Female: Wing, 52–54 (53.7); tail, 46–50 (47.5); bill, 9–10 (9.7); tarsus, 18–19.5 (19).

Range.—Subtropical Zone, Andes of southwestern Ecuador.

Remarks.—"This form belongs in the group of birds of Marañon origin in western Ecuador." It appears to be sufficiently well marked by the characters above outlined, although I am unable to verify all the differences called for in the original description. Comparison with a larger series of true *trifasciatus* is, of course, desirable.

Specimens examined.—Ecuador: Celica (6,900 feet), Loja, 3; San Bartolo (7,500 feet), Alamor Range, Loja, 5; El Chiral (5,350 feet), Santa Rosa-Zaruma trail, Oro, 9 (including type); La Puente (2,500 feet), Oro, 1; Lunamá (4,600 feet), Loja, 3; Guainche (3,200 feet), S. E. of Alamor, Loja, 1; Punta Santa Ana (3,650–4,500 feet), Portovelo-Loja trail, Oro, 6; Guachanama (9,050 feet), Loja, 2; Cebollal (3,100 feet), Loja, 2; Zaruma (6,000 feet), Oro, 7; Loja, 1; Alamor (4,550 feet), Loja, 14; Las Piñas, 1; Jima, 1. Total. 56.

BASILEUTERUS HYPOLEUCUS Bonaparte

Basileuterus hypoleucus BONAPARTE, *Consp. Avium*, vol. 1, 1850, p. 313 (Brazil; orig. descr.; type in coll. Berlin Mus.).—BURMEISTER, *Syst. Ueber. Thiere Brasiliens*, vol. 3, 1856, p. 113, note (Brazil; ref. orig. descr.).—BAIRD, *Rev. Amer. Birds*, 1865, p. 242, note (diag.), p. 243 (refs.).—SCLATER and SALVIN, *Proc. Zool. Soc. London*, 1868, p. 170, in

text (Brazil).—VON PELZELN, Orn. Brasiliens, pt. 2, 1868, p. 72 (Ypanema and Goyaz, Brazil; refs.).—REINHARDT, Vidensk. Med. Nat. For. Kjobenhavn, 1870, p. 445 (Lagoa Santa, Minas Geraës, Brazil).—SHARPE, Cat. Birds Brit. Mus., vol. 10, 1885, p. 388 (Lagoa Santa and Ypanema, Brazil; descr.; refs.).—ALLEN, Bull. Amer. Mus. Nat. Hist., vol. 3, 1891, p. 344 (Chapada, Matto Grosso, Brazil; plum.; meas.).—VON IHERING, Proc. Zool. Soc. London, 1899, p. 516 (faunal range).—SALVADORI, Boll. Mus. Zool. ed Anat. comp. Torino, vol. 15, No. 378, 1900, p. 3 (Urucum, Matto Grosso, Brazil; refs.).—VON IHERING and VON IHERING, Aves do Brazil, 1907, p. 333 (San José do Rio Pardo, Itatiba, Franca, Avanhandava, and Itapura, Brazil; range).—HELLMAYR, Nov. Zool., vol. 15, 1908, p. 19 (Rio Thesouras, Goyaz; Victoria, São Paulo; Rio Jordão, Minas Geraës; crit.).—WETMORE, Bull. U. S. Nat. Mus., No. 133, 1926, p. 368 (Puerto Pinasco, Paraguay; crit.).

Description.—Pileum with two broad lateral stripes of black, meeting on the forehead and reaching to the nape, and inclosing a median stripe or spot of dull orange rufous, overlaid by pallid neutral gray; superciliary stripe pallid neutral gray; an indistinct dusky stripe through the eye, the sides of the head below this dull grayish; upper parts, including the wings and tail externally, buffy olive, brighter, more yellowish olive, on the rump and upper tail-coverts; under parts white with a faint grayish cast; tibiae and under wing-coverts primrose yellow, and crissum washed with the same color; "iris dark brown; bill dusky above, pale below; feet pale yellowish."

Measurements.—Male: Wing, 58–65 (average, 62); tail, 54–61 (57.5); bill, 10–11 (10.5); tarsus, 19–21.5 (20). Female: Wing, 54–61 (57.5); tail, 49–56 (52); bill, 9.5–10 (9.7); tarsus, 18.5–20 (19.2).

Range.—Brazil, from southern Matto Grosso and Goyaz to São Paulo and Paraguay.

Remarks.—Natterer was the real discoverer of this species, having taken specimens as early as 1819. Lund took it at Lagoa Santa, in the State of Minas Geraës, in 1837, but it escaped description until 1850, when Bonaparte gave a brief but sufficient diagnosis, using a manuscript name applied by Cabanis to a specimen in the Berlin Museum. It remained a rare species in collections until Herbert H. Smith took a large series of specimens at Chapada, Matto Grosso, which were studied by Allen at the American Museum of Natural History, whence they have since found their way to other institutions. The yellow wash on the breast and belly shown by some examples, as Allen remarks, is probably indicative of high plumage, and furthermore suggests the relationship of this species to the yellow-bellied *auricapillus* group.

Specimens examined.—Brazil: Chapada, Matto Grosso, 57; Belvedere de Urucum, Matto Grosso, 8; Victoria, São Paulo, 3. Paraguay: Puerto Pinasco, 1. Total, 68.

BASILEUTERUS AURICAPILLUS AURICAPILLUS (Swainson)

- "Contramaestre coronado" AZARA, *Apuntamientos*, vol. 2, 1802, p. 414 (Paraguay; descr.; habits).
- Sylvia vermivora* (not *Motacilla vermivora* Gmelin) VIEILLIOT, *Nouv. Dict. d'Hist. Nat.*, vol. 11, 1817, p. 278, part (Paraguay, ex Azara).
- Muscicapa vermivora* LAFRESNAYE and D'ORBIGNY, *Syn. Avium*, pt. 1, *Mag. Zool.*, cl. ii, 1837, p. 51, part (Corrientes, Argentina).
- Muscicapara vermivora* D'ORBIGNY, *Voy. Am. Mérid.*, Ois., 1844, p. 324, part (Corrientes, Argentina; descr.; habits).
- Setophaga auricapilla* SWAINSON, *Anim. in Menag.*, 1838, p. 293 ("Mexico" [error] and Brazil; orig. descr.; type in coll. —?).
- Helinaia vermivora* HARTLAUB, *Index Azara*, 1847, p. 10 (Azara's refs.).
- Basileuterus vermivorus* CABANIS and HEINE, *Mus. Heineanum*, vol. 1, 1850, p. 17, excl. syn. part (Brazil; refs.).—BURMEISTER, *Syst. Ueber. Thieré Brasiliens*, vol. 3, 1856, p. 113, excl. syn. part (Neu Freiburg, Brazil; descr.; refs.).—BAIRD, *Rev. Amer. Birds*, 1865, p. 242 (diag.), p. 243, part (refs.; range).—SCLATER, *Proc. Zool. Soc. London*, 1865, p. 283, part (refs.; diag.; range).—EULER, *Journ. f. Orn.*, 1868, p. 190 (Cantagallo, Brazil; descr. nest and eggs).—VON PELZELN, *Orn. Brasiliens*, pt. 2, 1868, p. 71 (Rio de Janeiro, Mattodentro, Ypanema, Ytararé, and São Vicente, Brazil).—REINHARDT, *Vidensk. Med. Nat. For. Kjobenhavn*, 1870, p. 445 (Uberaba, Brazil).—HAMILTON, *Ibis*, 1871, p. 302 (São Paulo, Brazil; habits).—VON BERLEPSCH, *Journ. f. Orn.*, vol. 21, 1873, p. 231 (Blumenau, Santa Catharina, Brazil; refs.; range [part]).—CABANIS, *Journ. f. Orn.*, vol. 22, 1874, p. 82 (Cantagallo, Brazil).—VON BERLEPSCH, *Journ. f. Orn.*, vol. 27, 1879, p. 208, in text (Santa Catharina, Brazil; Buenos Aires, Argentina; crit.).—WHITE, *Proc. Zool. Soc. London*, 1882, p. 594 (San Javier, Misiones, Argentina).—GOELDI, *Aves do Brasil*, 1894, pp. 269, 271 (Serra dos Orgãos, Brazil; descr.; habits).—VAN OORT, *Mus. d'Hist. Nat. Pays-Bas*, vol. 10, 1907, p. 244 (Porto Real, Brazil).
- Basileuterus auricapillus* VON BERLEPSCH, *Ibis*, 1881, p. 240 (crit.).—FORBES, *Ibis*, 1881, p. 329 (Quipapá, Pernambuco, Brazil).—SHARPE, *Cat. Birds Brit. Mus.*, vol. 10, 1885, p. 393, part (Pernambuco and Mattodentro, Brazil; descr.; refs.; crit.).—SCLATER and HUDSON, *Argentine Orn.*, vol. 1, 1888, p. 21 (Paraguay, ex Azara; Misiones, Argentina, ex White; descr.; refs.).—KERR, *Ibis*, 1892, p. 123 (Rio Pilcomayo, Argentina).—VON IHERING, *Rev. Mus. Paulista*, vol. 3, 1898, p. 134 (São Paulo and Iguaçu, Brazil; Brazilian records).—SALVADORI, *Boll. Mus. Zool. ed Anat. comp. Torino*, vol. 15, No. 378, 1900, p. 17 (Tebicuari, Paraguay).—OBERHOLSER, *Proc. U. S. Nat. Mus.*, vol. 25, 1902, p. 141 (Sapucay, Paraguay; crit.).—LILLO, *An. Mus. Nac. Buenos Aires*, ser. 3, vol. 1, 1902, p. 173 (Tafi, Tucumán, Argentina); *Rev. Letras y Cien. Sociales Tucumán*, 1905, p. 7 of reprint (Tafi, Tucumán, Argentina).—HELLMAYR, *Nov. Zool.*, vol. 13, 1906, p. 7, in text (range; crit.).—VON IHERING and VON IHERING, *Aves do Brasil*, 1907, p. 333 (Ypiranga, Campos de Jordão, Alto da Serra, Ytararé, Itapura, Piquete, Iguaçu, and Ourinho, Brazil; range).—LÜDERWALDT, *Zool. Jahrb.*, vol. 27, 1909, p. 356 (Campo Itatiaya, Brazil).—DABBENE, *An. Mus. Nac. Buenos Aires*, vol. 11, 1910, p. 369 (Argentine localities and refs.).—REISER, *Denks. Math.-Nat. Kl. K. Akad. Wiss. Wien*, vol. 76, 1910, p. 78 (Santo Antonio de Gilboez, Barra do Cocal, and Oberhalb Pintados, Rio Parnahyba, Piahy, Brazil).—CHUBB,

- Ibis, 1910, p. 615 (Sapucay, Paraguay; refs.; crit.).—GRANT, Ibis, 1911, p. 88 (Riacho Ancho, Argentina).—BERTONI, Fauna Paraguaya, 1913, p. 60 (Alto Paraná, Paraguay).—ARBIBALZAGA, El Hornero, vol. 2, 1920, p. 97 (Resistencia, Chaco, Argentina).—GIACOMMELLI, El Hornero, vol. 3, 1923, p. 67 (Prov. La Rioja, Argentina).—PEREYRA, El Hornero, vol. 3, 1923, p. 170 (San Isidro, Buenos Aires, Argentina).—SNETHLAGE, Journ. f. Orn., vol. 76, 1928, p. 536 (range in N. E. Brazil).
- Basileuterus auricapillus auricapillus* HARTERT and VENTURI, Nov. Zool., vol. 16, 1909, p. 166 (Barracas al Sud, Ocampo, and Quebrada de los Piédros, Argentina).—DABBENE, An. Mus. Nac. Buenos Aires, vol. 23, 1912, p. 348 (Paso Yunay, Paraguay; Paraguayan refs.).—MARELLI, Mem. Min. Obras Publicas, 1924, p. 656 (Prov. Buenos Aires, Argentina; range).—HELLMAYR, Nov. Zool., vol. 32, 1925, p. 180 (Corrientes, Argentina, etc.; crit. on type).—WETMORE, Bull. U. S. Nat. Mus., No. 133, 1926, p. 368 (Las Palmas, Argentina; Lazcano, Uruguay; crit.; habits).—HOLT, Bull. Am. Mus. Nat. Hist., vol. 57, 1928, 314 (Serra do Itatiaya, Brazil; local range).

Description.—Pileum with two broad lateral stripes of black, meeting in front, and reaching to the nape, and inclosing a median stripe or spot which varies from Mars yellow to orange rufous on the vertex (more or less overlaid by grayish feather-tipping), and is olive buff on the nape; superciliaries, suborbital spot, and chin buffy olive; broad transocular streak dusky blackish; subauricular region and sides of the neck dull grayish; upper parts, and wings and tail externally, dark citrine; under parts lemon chrome, paler on the crissum, with more or less shading of sulphine yellow on the sides and flanks; under wing-coverts yellowish white; bill brownish; feet light brown (in skin). (Young stages not seen.)

Measurements.—Male: Wing, 55–61 (58); tail, 52–55 (53.5); bill, 9–11 (10); tarsus, 17.5–19.5 (18.5). Female: Wing, 53–58 (55.5); tail, 50–54 (51.5); bill, 9.5–10.5 (10); tarsus, 17.5–19.5 (18.2).

Range.—Eastern Brazil (Ceará) south to the Province of Buenos Aires, Argentina, and west to Tucumán.

Remarks.—Azara was the first author to mention this species, which has figured extensively in the literature of South American ornithology ever since. Unfortunately, however, Vieillot described Azara's bird under the same heading as the North American *Helmitheros vermivorus*, and the specific name of the latter was accepted without question for the present form until von Berlepsch pointed out the error in 1881, substituting Swainson's name *auricapillus*. Swainson gave "Mexico and Brazil" as the habitat of his new species; the former was, of course, wrong, and if it is thought desirable to suggest a still more explicit type locality, I would propose Rio de Janeiro, Brazil.

The above description is based mainly on the series from Therezopolis, which I take to be typical. Skins from Argentina and Paraguay are duller green above, and are with difficulty separable from

olivascens. In fact, I keep them with *auricapillus* mainly because they resemble that form in the prominence of the head-stripes, which are less distinct in *viridescens*, and because the series from Itatiaya are also of this duller type. Formal separation would further complicate matters, I fear, when it comes to defining the ranges of the several forms. Old skins appear to be duller yellow below than freshly collected ones.

Specimens examined.—Brazil: Baturité, Ceará, 2; Jacaresinha, 1; Castro, Paraná, 1; Fazenda Cayoa, 1; Rio de Janeiro, 2; Therezopolis, Organ Mountains, 14; Macieiras (5,900 feet), Serra do Itatiaya, 5; Monte Serrat (2,900 feet), Serra do Itatiaya, 2; Ponte Maromba (3,500–3,800 feet), Serra do Itatiaya, 3; Ytararé, São Paulo, 1; São Lourenço, Rio Grande do Sul, 2; Camaquã, Rio Grande do Sul, 2. Argentina: Above San Pablo (4,000 feet), Tucumán, 5; Tafi trail (2,000 feet), Tucumán, 3; Sarmiento (1,700 feet), Tucumán, 1; Las Palmas, Chaco, 2; Pto. Aguirre, 1; Barracas al Sur, Buenos Aires, 1. Uruguay: Lazcano, 1. Paraguay: Sapucay, 2; Puerto Bertoni, 1; unspecified, 1. Unspecified, 2. Total, 56.

BASILEUTERUS AURICAPILLUS VIRIDESCENS Todd

Muscicapa vermicivora (not *Motacilla vermicivora* Gmelin) LAFRESNAYE and D'ORBIGNY, Syn. Avium, pt. 1, Mag. Zool., cl. ii, 1837, p. 51, part (Chiquitos, Bolivia).

Muscipara vermicivora D'ORBIGNY, Voy. Amér. Mérid., Ois., 1844, p. 324, part ("Monte grande [grande forêt] que sépare Santa-Cruz de la Sierra de Chiquitos," Bolivia; descr.; habits).

Basileuterus vermicivorus SCLATER and SALVIN, Proc. Zool. Soc. London, 1879, p. 594 (D'Orbigny's ref.).

Basileuterus auricapillus viridescens TODD, Proc. Biol. Soc. Washington, vol. 26, 1913, p. 170 (Buenavista, Bolivia; orig. descr.: type in coll. Carnegie Mus.).—HELLMAYR, Nov. Zool., vol. 32, 1925, p. 180 (Santa Cruz de la Sierra and Chiquitos, Bolivia; crit.).

Subspecific characters.—Similar to *Basileuterus auricapillus auricapillus*, but slightly paler and duller green above, with the head-stripes narrower and much less distinct, less purely black, and consequently less prominent.

Measurements.—Male (four specimens): Wing, 60–63 (average, 60.5); tail, 50–55 (52); bill, 9.5–10.5 (10); tarsus, 18.5. Female (four specimens): Wing, 55–60 (58); tail, 48–52 (51); bill, 9.5–10 (9.7); tarsus, 18–18.5 (18.4).

Range.—State of Santa Cruz, Bolivia, east of the Andes.

Remarks.—In describing this race it was compared with two specimens from Paraguay in the collection of the United States National Museum. With a satisfactory series of true *auricapillus* now available from southern Brazil (Therezopolis, Itatiaya, etc.), as well as additional specimens of the present race (it was originally character-

ized from a single pair of birds), it is obvious that the color differences sought to be established are not of much value. The Bolivian series are, if anything, a little duller above than the Brazilian, but not so dull as those from northern Argentina and Paraguay. From both they differ in the character of the head-stripes, as above described, and the form may be retained on this basis. Doctor Hellmayr recognizes it with reservations.

Specimens examined.—Bolivia: Buenavista, 5 (including type); Rio Surutu, 1; Cerro Hosane, 1; Santa Cruz de la Sierra, 1; Palmarito, 2. Total, 10.

BASILEUTERUS AURICAPILLUS OLIVASCENS Chapman

Basileuterus vermivorus (not *Motacilla vermivora* Gmelin) CABANIS, in Schomburgk, Reisen in Brit.-Guiana, vol. 3, 1848, p. 667, excl. syn. (Mount Roraima, 3,000–4,000 feet, British Guiana).—SCLATER, Proc. Zool. Soc. London, 1855, p. 144 ("Bogotá," Colombia).—SCLATER, Cat. Amer. Birds, 1861, p. 34, excl. syn. part ("Bogotá," Colombia; Trinidad); Proc. Zool. Soc. London, 1865, p. 283, part (diag.; refs.).—FINSCH, Proc. Zool. Soc. London, 1870, p. 565 (Trinidad).

Trichas bivittatus (not *Muscicapa bivittata* LAFRESNAYE and D'ORBIGNY) Léotaud, Ois. Trinidad, 1866, p. 184 (Trinidad; descr.; habits).

Basileuterus aurocapillus (not *Setophaga auricapilla* Swainson) von BERLEPSCH, Journ. f. Orn., vol. 32, 1884, p. 284, in text ("Bogotá," Colombia; Trinidad; crit.).

Basileuterus auricapillus SALVIN, Ibis, 1885, p. 203 (Mount Roraima, Brit. Guiana; refs. [part]).—SHARPE, Cat. Birds Brit. Mus., vol. 10, 1885, p. 393, part (Mount Roraima, Brit. Guiana; Trinidad; "Bogotá," Colombia; crit.).

Basileuterus vermivorus olivascens CHAPMAN, Auk, vol. 10, 1893, p. 343 (Princetown, Trinidad; orig. descr.; type in coll. Amer. Mus. Nat. Hist.).—CHAPMAN, Bull. Amer. Mus. Nat. Hist., vol. 6, 1894, p. 7 (range), p. 13 (ref. orig. descr.), p. 17 (song) p. 24 (Princetown, Trinidad; descr.; crit.).—PHELPS, Auk, vol. 14, 1897, p. 302 (range), pp. 363, 368 (San Antonio, Venezuela).

Basileuterus auricapillus olivascens HELLMAYR, Nov. Zool., vol. 13, 1906, p. 7 (Caparo and Laventville, Trinidad; Cumaná, Venezuela; crit.).—CHERRIE, Mus. Brooklyn Inst. Sci. Bull., vol. 1, 1906, p. 187 (Heights of Aripo, Trinidad); 1908, p. 356 (Carenage and Heights of Aripo, Trinidad; descr. nest and eggs).—STONE, Proc. Acad. Nat. Sci. Philadelphia, 1913, p. 208 (Cariaquito, Venezuela).—CHERRIE, Mus. Brooklyn Inst. Sci. Bull., vol. 2, 1916, p. 153 (Trinidad; Guanoco, Orinoco River, Venezuela, ex Beebe).—CHAPMAN, Bull. Amer. Mus. Nat. Hist., vol. 36, 1917, p. 552 (Buena Vista and Villavicencio, Colombia; range; crit.).—HELLMAYR, Arch. f. Naturg., vol. 90, A, 1924, p. 157, in text (range; crit.).

Basileuterus olivascens CHUBB, Birds Brit. Guiana, vol. 2, 1921, p. 417 (Mt. Roraima, Brit. Guiana; refs.; descr.).

Basileuterus auricapillus olivaceus (lapsus) BEEBE, Zoologica, vol. 1, 1909, p. 101 (Guanoco, Venezuela; habits).

Basileuterus aurocapilla PENARD, Vogels van Guyana, 1910, p. 490 (Guiana; descr.; range; descr. eggs, ex Nehr Korn).

Subspecific characters.—Similar to *Basileuterus auricapillus auricapillus*, but upper parts duller and darker green, near olive citrine.

Measurements.—Male: Wing, 57–65 (average, 61); tail, 52–56 (54); bill, 9.5–10.5 (10); tarsus, 18.5–20 (19.3). Female: Wing, 55–60 (57.5); tail, 50–53 (51.5); bill, 10–10.5 (10.2); tarsus, 18–19.5 (18.5).

Range.—Colombia and Venezuela, east of the Andes, to British Guiana, and north to Cumaná and Trinidad.

Remarks.—In 1885 Sharpe called attention to the peculiarities of northern examples of this species, and some years later Doctor Chapman ventured to give a name to the bird of Trinidad. He compared it with “mainland” specimens, but whether he meant the mainland of Venezuela he does not say. Our series from the Orinoco Valley are indistinguishable from those of Trinidad, and Doctor Hellmayr recognizes the form on the same general grounds as are claimed for it by the describer. Skins from Mount Roraima are slightly more brownish above and duller yellow below than the rest; if this is not due to the age of the specimens they may constitute a slightly differentiated local race. Our series from eastern Colombia are also a little darker, duller, more grayish, less brownish olivaceous above than the typical Trinidad skins; the bill, too, is darker in the dried skins. Doctor Chapman remarks similar differences in the case of the specimens he handled from farther south at the foot of the Andes. The differences may be due to the fresher condition of the present lot of specimens (shot March 27 to April 29), but at any rate they are too slight to require nomenclatural recognition.

The race is, however, not nearly so well differentiated as one would expect in view of its complete isolation from the typical form by the interposition of the Amazon Valley. Some specimens of the southern race are scarcely distinguishable, in fact, but when compared in series the two are easily discriminated. The peculiar discontinuous distribution of *Basileuterus auricapillus* parallels that shown by a number of other birds.

Specimens examined.—Trinidad: Carenage, 5; Heights of Aripo, 7; Caparo, 1; Princetown, 2 (including type); unspecified, 1. British Guiana: Mount Roraima, 5; Annai, 1. Venezuela: Cristobal Colon, Paria Peninsula, 9; San Antonio, Bermudez, 6; Cariaquito, 1; Caura Valley, 1; Upata, 1; El Callao, 2; El Peru Mine, 2; San German de Upata, 1; Altagracia, 1; Cocallar (2,600 feet), 1; unspecified, 5. Colombia: Rio Negro, 7; Palmar, 1; La Colorada, 3; “Bogotá,” 5; Buena Vista, above Villavicencio, 3. Total, 71.

BASILEUTERUS CABANISI CABANISI von Berlepsch

Basileuterus cabanisi VON BERLEPSCH, Orn. Centralblatt, 1879, p. 63 (San Esteban and Puerto Cabello, Venezuela; orig. descr.; type now in coll. Frankfort Mus.); Journ. f. Orn., vol. 32, 1884, pp. 276, 283, part (Bucaramanga, Colombia, and Puerto Cabello, Venezuela; crit.).—CHAPMAN, Bull.

Amer. Mus. Nat. Hist., vol. 36, 1917, p. 551, part (Peque and Miraflores, Colombia; Merida, Venezuela; crit.).—HELLMAYR, Arch. f. Naturg., vol. 90, A, 1924, p. 157, part (Loma Redonda and Andes of Merida, Venezuela; Primavera and Bucaramanga, Colombia; range; crit.).

Description.—Pileum with two lateral stripes of black, reaching to the nape, and inclosing a median stripe of olive buff, which is more or less tinged with Mars yellow on the vertex, appearing on the bases of the feathers; superciliaries, chin, and subocular region olive buff; transocular stripe dusky black; sides of the neck, and upper parts in general, including the wings and tail externally, neutral gray, the back often with an olivaceous wash; wing-coverts sometimes with faint whitish tips; under parts bright yellow (lemon chrome), the sides with more or less wash of sulphine yellow, the crissum paler and more whitish; bend of wing yellowish; under wing-coverts white; "iris brown; feet pale brownish flesh-color; bill black, dark horn below."

Juvenal plumage (No. 89,865, Collection Carnegie Museum, July 6): Above dull mouse gray, almost uniform; throat and breast similar but duller and paler, with a yellowish tinge, passing into pale buffy yellow posteriorly.

Measurements.—Male: Wing, 56–61 (average, 58.5); tail, 51–57 (53.5); bill, 10.5; tarsus, 18.5–20 (19). Female: Wing, 53–57 (54); tail, 49–52 (50.5); bill, 9.5–10.5 (10.3); tarsus, 17.5–19 (18.3).

Range.—Subtropical Zone, Andes of Colombia and Venezuela.

Remarks.—In general, *Basileuterus cabanisi* would seem to be a bird of the Subtropical Zone, but it drops down to as low as 1000 feet in some places. It is certainly a close ally (and probably a derivative) of *B. auricapillus olivascens*, which occupies the Tropical Zone in the Orinoco Valley and the northeastern part of Venezuela, reaching also to Trinidad. Their respective ranges approximate each other at certain points, but are not known to overlap. I do not consider them conspecific, however. Count von Berlepsch's type series came from San Esteban and Puerto Cabello (probably actually higher up), Venezuela, but he was mistaken in placing previous Venezuelan and Trinidad records for *B. "vermivorus"* under the same head. The species was presently reported from Bucaramanga, Colombia, and more recently has been traced to the Central and Western Andes of the same country by Doctor Chapman and Mr. Carriker. Our specimens from these parts are quite indistinguishable from those coming from Venezuela, all having the crown showing a more or less decided spot of Mars yellow. Three specimens in the von Berlepsch collection, however, lack any of this color on the crown, and are thus scarcely to be told from the race of the Santa Marta Mountains, *B. c. indignus*.

Specimens examined.—Venezuela: Aroa, 1; Lagunita de Aroa, 1; Anzoategui, 1; El Trompillo, 2; Sierra de Carabobo, 11; Loma Redonda, 3; Guamito, 3; Tabay, 5; Merida, 5; La Azulita, 2; San Esteban, 2; Valle, Merida, 2; Escorial (3,000 m.), 4; Culata (3,000 m.), 2; El Liman (1,000 feet), Valley of Puerto La Cruz, 1; Macuto, Caracas, 1; Caracas, 7; Lake Valencia, 2; Colon, Tachira, 1; unspecified, 1. Colombia: El Cauca, 8; La Palmita, 6; Yumbo, 1; Bucaramanga, 1; Miraflores (6,800 feet), 1; Peque (5,000 feet), Antioquia, 1. Total, 75.

BASILEUTERUS CABANISI INDIGNUS Todd

Basileuterus cabanisi (not of von Berlepsch) SALVIN and GODMAN, Ibis, 1880, p. 117 (Minca, Colombia).—VON BERLEPSCH, Journ. f. Orn., vol. 32, 1884, p. 283, part (Salvin and Godman's record).—SHARPE, Cat. Birds Brit. Mus., vol. 10, 1885, p. 384 (Minca, Colombia; descr.; refs. [part]).—BANGS, Proc. Biol. Soc. Washington, vol. 12, 1898, p. 144 ("Santa Marta," Colombia).—ALLEN, Bull. Amer. Mus. Nat. Hist., vol. 13, 1900, p. 176 (Minca, Las Nubes, and Onaca, Colombia).—CHAPMAN, Bull. Amer. Mus. Nat. Hist., vol. 36, 1917, p. 551, part (Onaca, Colombia).—HELLMAYR, Arch. f. Naturg., vol. 90, A, 1924, p. 157, part (Don Amo and Onaca, Colombia; crit.).

Basileuterus cabanisi indignus TODD, Proc. Biol. Soc. Washington, vol. 29, 1916, p. 95 (La Tigrera, Colombia; orig. descr.; type in coll. Carnegie Mus.).—TODD and CARRIKER, Ann. Carnegie Mus., vol. 14, 1922, pp. 54, 65, 78, 440 (Santa Marta localities and refs.; range; habits; crit.).

Subspecific characters.—Similar to *Basileuterus cabanisi cabanisi*, but coronal spot usually plain lemon yellow, with little or no Mars yellow.

Measurements.—Male (nine specimens): Wing, 56–61 (average, 58); tail, 49–54 (52); bill, 9.5–10.5 (10); tarsus, 17.5–20 (18.3). Female (five specimens): Wing, 53–55 (54); tail, 48–51 (50); bill, 9.5–10.5 (10); tarsus, 17.5–18.5 (18).

Range.—Upper Tropical Zone, Santa Marta region of Colombia.

Remarks.—This race rests upon a single character, namely, the different color of the coronal spot. Out of 25 specimens examined in the present connection, only 2 have more than a trace of Mars yellow on the middle of the crown (No. 42,102, collection Carnegie Museum, and No. 70,500, collection American Museum of Natural History), while this color is well developed in all but a few of the large series examined from Venezuela and the Colombian Andes. These exceptions are nearly all females, and need not impugn the validity of the race, as the individual variation is not excessive, and is no more than would be expected, judging by analogy. Although the propriety of separating the Santa Marta birds has been questioned in some quarters, on again going over the matter with a larger series I can only reiterate my opinion that such action was justifiable.

Specimens examined.—Colombia: "Bonda" (?), 1; Las Nubes, 2; Onaca, 8; La Tigrera, 2 (including type); Las Vegas, 8; Minca, 3; Santa Marta Mountains (4,000 feet), 1. Total, 25.

BASILEUTERUS CULICIVORUS CULICIVORUS (Lichtenstein)

Sylvia culicivora LICHTENSTEIN, Preis.-Verz. Mex. Vögel, 1830, p. 2 ("Mexico"; orig. descr.; type in coll. —).—CABANIS, Journ. f. Orn., vol. 11, 1863, p. 57 (reprint orig. descr.).

Basileuterus culicivora BONAPARTE, Consp. Avium, vol. 1, 1850, p. 313 (Jalapa, Mexico; diag.).

Basileuterus culicivorus CABANIS and HEINE, Mus. Heineanum, vol. 1, 1850, p. 17 (Jalapa, Mexico; descr.).—BAIRD, Rev. Amer. Birds, 1865, pp. 242, 245, part (Mexico; Choctum, Vera Paz, Guatemala; descr.; refs.; crit.).—SUMICHRAST, Mem. Boston Soc. Nat. Hist., vol. 1, 1869, p. 546 (Temperate Region, Vera Cruz).—BAIRD, BREWER, and RIDGWAY, Hist. N. Amer. Birds, vol. 1, 1874, p. 312, part (diag.).—BOUCARD, Ann. Soc. Linn. Lyon, n. s., vol. 25, 1878, p. 40 (Guatemala).—SALVIN and GODMAN, Biol. Centr.-Amer., Aves, vol. 1, 1881, p. 171, part (Mexican and Guatemalan localities and refs.; descr.; range; crit.).—SHARPE, Cat. Birds Brit. Mus., vol. 10, 1885, p. 383, part (Mexican and Guatemalan localities and refs.; descr.; crit.).—VON BERLEPSCH, Auk, vol. 5, 1888, p. 450, in text (Guatemala; meas.).—UNDERWOOD, Ibis, 1896, p. 434 (Volcano Miravalles, Costa Rica).—CHAPMAN, Bull. Amer. Mus. Nat. Hist., vol. 10, 1898, p. 25 (Jalapa, Vera Cruz).—NELSON, Auk, vol. 15, 1898, p. 159 (San Sebastian, Jalisco, and Pluma, Oaxaca).—DEARBORN, Field Mus. Orn. Ser., vol. 1, 1907, p. 131 (Patulul, Guatemala).

Basileuterus brasieri (not *Muscicapa brasieri* Giraud) SCLATER, Proc. Zool. Soc. London, 1855, p. 66 (crit.); 1856, p. 292 (Cordova, Mexico); 1859, p. 374 (Teotacingo, Oaxaca).—SALVIN and SCLATER, Ibis, 1860, p. 274 (Volcan de Fuego, Guatemala; habits).—SCLATER, Proc. Zool. Soc. London, 1865, p. 283, excl. syn. part (refs.; diag.; range).

Basileuterus culicivorus culicivorus RIDGWAY, Bull. U. S. Nat. Mus., No. 50, vol. 2, 1902, p. 753, part (descr.; range; meas.; excl. Costa Rican localities and refs.).—CARRIKER, Ann. Carnegie Mus., vol. 6, 1910, p. 794, part (localities in northwestern Costa Rica only).—PETERS, Auk, vol. 30, 1913, p. 378 (Camp Mengel, Quintana Roo, Mexico).—BANGS and PETERS, Bull. Mus. Comp. Zool., vol. 67, 1927, p. 484 (Presidio and Motzorongo, Vera Cruz).

Basileuterus culicivorus flavescens RIDGWAY, Bull. U. S. Nat. Mus., No. 50, vol. 2, 1902, p. 755 (San Sebastian, Jalisco, Mexico; orig. descr.; type in coll. U. S. Nat. Mus.).

Description.—Pileum with two broad lateral stripes of black, produced to the nape, and inclosing a broad median stripe of empire yellow, passing into ecru olive posteriorly, this yellow color sometimes more or less tinged with raw sienna, or even wholly of this color; rest of the upper parts, and the wings and tail externally, dark olive gray; sides of the head yellowish olive with more or less of a grayish cast, the loreal and postorbital spots blackish, the upper and under eyelids dull yellow, and the supraloral region the same; entire under parts bright yellow (lemon chrome), the breast, sides, and

flanks shaded with sulphine yellow; "iris brown; bill brownish black, paler below; feet flesh color." (Young stages not seen.)

Measurements.—Male: Wing, 59–63 (average, 61); tail, 52–57 (53.5); bill, 9.5–11 (10.2); tarsus, 18–19.5 (19). Female: Wing, 54–58 (56); tail, 48–52 (49.5); tail, 9–10.5 (9.7); tarsus, 17.5–19.5 (18.8).

Range.—Southern Mexico, from Vera Cruz (also in Jalisco) and Pueblo south and east to Chiapas and Campeche, and to Guatemala; reappearing in northern Nicaragua and northwestern Costa Rica.

Remarks.—I select as type locality for this form Jalapa, Vera Cruz, ex Cabanis, 1850, who was the next after Lichtenstein to record it. Selater at first overlooked Lichtenstein's brief diagnosis, and identified the form with the *Muscicapa brasieri* of Giraud, with which it is now considered conspecific, as given by Mr. Ridgway in his great work. I can not, however, follow this noted authority in separating the birds from Jalisco under another name, *flavescens*. I find that the type and topotype of this supposed new race are so closely matched by skins from Jalapa and other points in eastern Mexico that I could not think of separating them, certainly not on the basis of only two specimens. On the other hand, there appears to be some geographical variation in evidence between specimens from the northern and southern parts of the range, respectively. Thus, only 10 out of 53 skins from Mexico, Guatemala, and British Honduras show any decided admixture of "orange rufous" (i. e., raw sienna) on the crown, the majority of the individuals being plain yellow on this part. By way of contrast, only 14 out of 63 specimens from Nicaragua and northwestern Costa Rica fail to show decidedly this reddish color. (All the specimens of this race from Costa Rica come from the northwestern part of the country; those from other parts I refer to *godmani*.) Nevertheless, to set up the southern birds as an intermediate race on the basis of this imperfectly differentiated character would be highly undesirable.

Specimens examined.—Mexico: Jalapa, Vera Cruz, 14; Pasa Nueva, Vera Cruz, 1; Buena Vista, Vera Cruz, 1; Motzorongo, Vera Cruz, 2; Presidio, Vera Cruz, 1; San Andreas Tuxtla, Vera Cruz, 1; Mirador, Vera Cruz, 3; Cordova, Vera Cruz, 1; Metlatoyuca, Puebla, 4; mountains near Santo Domingo, Oaxaca, 2; Choapam, Oaxaca, 1; Pluma, Oaxaca, 2; San Sebastian, Jalisco, 2 (including type of *B. c. flavescens*); Teapa, Tabasco, 5; Apazote, Campeche, 1; Camp Mengel, Quintana Roo, 1; Amatan, Chiapas, 2; Ocuilapa, Chiapas, 2; unspecified, 2. British Honduras: Manatee Lagoon, 2; El Cayo, 1. Guatemala: Vera Paz, 1; Patulul, 2; Finca Sepacuile, 12; Secanquim, 5; Finca El Espino, 1; unspecified, 13. Nicaragua: Rio Coco

(Wanks River), 1; San Rafael del Norte, 1. Costa Rica: Tenorio, 26; Miravalles, 17; La Vijagua, 3; El General, 4; Cerro Santa Maria, 15. Total, 152.

BASILEUTERUS CULICIVORUS BRASHERII (Giraud)

Musicapa brasierii (error typ.) GIRAUD, Sixteen Species of Texas Birds, 1841, pl. [6], fig. 2 and text ("Texas"; orig. descr.; type in coll. U. S. Nat. Mus.).—SCLATER, Proc. Zool. Soc. London, 1855, p. 66 (crit.).

Basileuterus braiseri BAIRD, Rept. Pacific R. R. Surv., vol. 9, 1858, p. 306 (in list of species; refs.).

Basileuterus brasherii BERIER, Bull. Nuttall Orn. Club, vol. 5, 1880, p. 239 (crit. on name).

Basileuterus culicivorus (not *Sylvia culicivora* Lichtenstein) RIDGWAY, Proc. U. S. Nat. Mus., vol. 3, 1880, p. 174 (in list of N. Amer. species), p. 216 (syn.), pp. 229, 232 (range).—RIDGWAY, Bull. U. S. Nat. Mus., No. 21, 1881, pp. 19, 62, 75, 78 (same matter).—AMERICAN ORNITHOLOGISTS' UNION COMMITTEE, Check-List of N. Amer. Birds, 1886, p. 318, part ("Texas," in range).—RIDGWAY, Man. N. Amer. Birds, 1887, p. 531, part ("Texas," in range).—ALLEN, Auk, vol. 10, 1893, p. 141 (faunal range).—RICHMOND, Proc. U. S. Nat. Mus., vol. 18, 1896, p. 632 (Alta Mira, Tamaulipas).

Basileuterus culicivorus brasherii RIDGWAY, Bull. U. S. Nat. Mus., No. 50, vol. 2, 1902, p. 755 (descr.; range; refs.).—AMERICAN ORNITHOLOGISTS' UNION COMMITTEE, Auk, vol. 21, 1904, p. 417 (in list of N. Amer. species); vol. 25, 1908, p. 354 (no valid Texas record).—STONE, Auk, vol. 36, 1919, p. 469 (Giraud's ref.).

Basileuterus culicivorus brasherii COOKE, Auk, vol. 22, 1905, p. 299, part (range).—PHILLIPS, Auk, vol. 28, 1911, p. 87 (Santa Leonor, Caballeros, Guaymas, Rio Martinez, and Rio Cruz, Tamaulipas, Mexico).

Subspecific characters.—Similar to *Basileuterus culicivorus culicivorus*, but upper parts paler, deep grayish olive, and light stripes of pileum averaging more greenish.

Measurements.—Male: Wing, 58–60 (average, 61.5); tail, 52–58 (55); bill, 9.5–10.5 (10); tarsus, 18–20 (19). Female: Wing, 55–63 (58); tail, 49–55 (53); bill, 9.5–10.5 (10); tarsus, 18.5–20.5 (19.5).

Range.—Northeastern Mexico, in States of San Luis Potosi, Nuevo Leon, southern Tamaulipas, and northern Vera Cruz.

Remarks.—This bird, named in honor of Philip Brasher, is one of Giraud's unconfirmed "Texas" records. It was early identified with *B. culicivorus* proper, and remained unrecognized until revived in a subspecific sense by Mr. Ridgway in 1902. Giraud's type specimen, still preserved in the collection of the United States National Museum, is worn and faded, but probably belongs to the race here characterized. It seems desirable to select a new type locality, and I would suggest Alta Mira, in the State of Tamaulipas, Mexico, as such. There is a specimen from Rivera, Vera Cruz (75 miles south of Tampico), in the collection of the American Museum of Natural History, showing that it ranges into northern Vera Cruz, and there are others from San Luis Potosi and Nuevo Leon.

An example in juvenal dress (No. 85,675, Collection American Museum of Natural History) is dull olive brownish above, the head more brownish; below buffy brownish.

Specimens examined.—Mexico: Alta Mira, Tamaulipas, 16; Tampico, Tamaulipas, 2; Rio Cruz, Tamaulipas, 23; Santa Leonor, Tamaulipas, 19; Rio Martinez, Tamaulipas, 1; Caballeros, Tamaulipas, 2; Guiaves, Tamaulipas, 4; Ciudad Victoria, Tamaulipas, 18; Sierra Madre, Victoria, Tamaulipas, 2; Boquilla, Nuevo Leon, 9; Cerro de la Silla, Nuevo Leon, 3; Jilitta, San Luis Potosi, 1; Rivera, Vera Cruz, 1; unspecified, 1. "Texas," 1 (type). Total, 103.

***BASILEUTERUS CULICIVORUS GODMANI* von Berlepsch**

Basileuterus culicivorus (not *Sylvia culicivora* Lichtenstein) BAIRD, Rev. Amer. Birds, 1865, p. 245, part (Barranca, Costa Rica; crit.).—LAWRENCE, Ann. Lyc. Nat. Hist. N. Y., vol. 9, 1868, p. 95 (Barranca, Guaitil, Grecia, and Dota, Costa Rica).—SALVIN, Proc. Zool. Soc. London, 1870, p. 183 (Calovevora, Veragua).—BOUCARD, Proc. Zool. Soc. London, 1878, p. 52 (San José, Costa Rica).—SALVIN and GODMAN, Biol. Centr.-Amer., Aves, vol. 1, 1881, p. 171, part (Costa Rica and Panama localities and refs.; crit.).—SHARPE, Cat. Birds Brit. Mus., vol. 10, 1885, p. 383, part (localities in Costa Rica and Veragua).—ZELEDON, An. Mus. Nac. Costa Rica, vol. 1, 1887, p. 107 (Sabanilla de Alajuela, Naranjo de Cartago, and Dota, Costa Rica).

Basileuterus godmani VON BERLEPSCH, Auk, vol. 5, 1888, p. 450 (Veragua; orig. descr.; type now in coll. Frankfort Mus.).

Basileuterus godmani (lapsus) CHERRIE, An. Inst. Fis.-Geog. Nac. Costa Rica, vol. 6, 1893, p. 10 (San Marcos, Sabanilla, and Naranjo de Cartago, Costa Rica; descr.; crit.).

Basileuterus culicivorus godmani BANGS, Proc. New England Zool. Club, vol. 3, 1902, p. 60 (Boquete and Volcan de Chiriqui, Panama).—RIDGWAY, Bull. U. S. Nat. Mus., No. 50, vol. 2, 1902, p. 756 (descr.; range; refs.).—FERRY, Field Mus. Orn. Ser., vol. 1, 1910, p. 277 (Guayabo, Costa Rica).

Basileuterus culicivorus culicivorus CARRIKER, Ann. Carnegie Mus., vol. 6, 1910, p. 794, part (Costa Rican localities and refs. [excl. N. W. Costa Rica]; habits; range; crit.).

Subspecific characters.—Similar to *Basileuterus culicivorus culicivorus*, but upper parts, sides of the head, etc., less grayish, more greenish (near yellowish olive), scarcely different from the color of the median stripe posteriorly.

Measurements.—Male: Wing, 59–66 (average, 62); tail, 50–57 (53); bill, 9.5–10.5 (10); tarsus, 19–20 (19.5). Female: Wing, 55–62 (58.5); tail, 46–54 (50.5); bill, 9.5–10.5 (10); tarsus, 18.5–20 (19).

Range.—Costa Rica (except northwestern part) to western Panama, chiefly in the Subtropical Zone.

Remarks.—Baird was the first author to notice that Costa Rican examples of this species were not quite the same as those from Mexico and Guatemala, and suggested that season might have something to do with the difference. Salvin and Godman also discussed

the case, but without reaching any definite conclusion. The late Count von Berlepsch formally separated the southern form in 1888, on the basis of the larger size and different coloration shown by two specimens from Veragua, and the name he gave has been accepted in a subspecific sense by Mr. Bangs and Mr. Ridgway for examples from that region. Both Mr. Ridgway and Mr. Carriker remark the intermediate character of Costa Rican specimens, but conclude to refer them all to *culicivorus* proper. After again going over the case with considerable additional material, however, I am satisfied that placing the birds from northwestern Costa Rica with true *culicivorus*, and those of all the rest of the country with *godmani*, really expresses the facts better than the other arrangement. Certainly, three birds from Guayabo, collected by Mr. Ridgway himself, are absolutely identical with Panama specimens, and others also are very close. I think it better to keep all the more greenish-backed birds with *godmani*, the more so as the series from northwestern Costa Rica, taken as a whole, are obviously grayer above than the others. The only other alternative would be to separate the Costa Rican bird under a new name, which is not advisable. The larger size of *godmani*, upon which von Berlepsch laid so much stress, proves to be too slight to be of any diagnostic value, and the color of the coronal spot also varies, although it is apparently more often tinged with orange rufous than in Mexican specimens of *culicivorus*.

Specimens examined.—Costa Rica: Aquinares, 3; Guiatil, 1; Juan Viñas, 4; La Estrella de Cartago, 3; Ujuras de Terraba, 4; Peralta, 1; Naranjo, 1; Barranca, 2; La Cedral Aserri, 1; San Marcos, 2; Dota, 1; Santa Maria de Dota, 11; La Gunaria, Santa Maria de Dota, 1; Navarro, 1; Grecia, 2; El Copey, 1; Bonilla, 4; Guayabo, 6; unspecified, 3. Panama: Volcan de Chiriqui, 3; Boquete, 16; unspecified, 1. Total, 72.

BASILEUTERUS BASILICUS (Todd)

Hemispingus basilicus TODD, Proc. Biol. Soc. Washington, vol. 26, 1913, p. 170 (San Lorenzo [de Santa Marta], Colombia; orig. descr.; type in coll. Carnegie Mus.).—TODD and CARRIKER, Ann. Carnegie Mus., vol. 14, 1922, p. 446, pl. 6 (San Lorenzo, Macotama, and Paramo de Mamarongo, Sierra Nevada de Santa Marta, Colombia; descr.; meas.; crit.; habits).

Description.—Adult male: back, wings externally, and tail dark warbler green; whole head and neck black, with broad and conspicuous superciliary and vertical stripes of pale grayish white, the vertical stripe strongly tinged anteriorly with citron yellow; an isolated broad white stripe or patch behind the ear-coverts, and some white mottling below the eye; throat (narrowly) dull white,

more or less speckled with dusky; rest of under parts lemon chrome, the sides and flanks darker, shaded with pyrite yellow; "bill black; feet brownish yellow or yellowish flesh-color; iris brown."

Adult female similar but rather duller. Immature male also similar, but the black areas of the head and neck duller, more brownish, and the superciliary and vertical stripes, and postauricular and subocular spots tinged with buffy, and less sharply defined.

Juvenal plumage: Similar in general to that of the adult, but everywhere darker and duller, the upper parts, etc., dark citrine; head and neck brown, with the light markings warm buff; chin and upper throat dull white; lower throat, breast, and sides shaded with citrine; abdomen amber yellow, and under tail-coverts sulphine yellow.

Measurements.—Male (five specimens): Wing, 67–70 (68.5); tail, 65–69 (66.5); bill, 11.5–13 (12.5); tarsus, 22–24 (22.7). Female (two specimens): Wing, 63–66; tail, 61–63; bill, 12–12.5; tarsus, 23–24.

Range.—Temperate Zone, Sierra Nevada de Santa Marta, Colombia.

Remarks.—The present description is reproduced from that in the paper by Mr. Carriker and the writer above cited. The plate is faulty in a measure, the yellow being too dull. A more careful study of this species shows that we were clearly in error in referring it to *Hemispingus*, and that it is instead a typical *Basileuterus*, with the prominent rectal bristles and color-pattern characteristic of that group. Although perfectly distinct from any other known species, its relationships possibly lie with *B. tristriatus*, which it resembles moreover in its faunal range, both being birds of the Temperate Zone in their respective mountain systems.

Specimens examined.—Colombia: San Lorenzo, 4; Macotama, 1; Paramo de Mamarongo, 4. Total, 9.

BASILEUTERUS IGNOTUS Nelson

Basileuterus melanogenys ignotus NELSON, Smithsonian Misc. Coll., vol. 60, No. 3, 1912, p. 21 (Mount Pirri, 5,200 feet, eastern Panama; orig. descr.; type in coll. U. S. Nat. Mus.).—GOLDMAN, Smithsonian Misc. Coll., vol. 69, No. 5, 1920, p. 40 (faunal range).—GRISCOM, Amer. Mus. Nov., No. 280, 1927, p. 13, in text (crit.).

Description.—Above dull green (near olive citrine), the wings and tail externally more brownish (near buffy citrine); pileum chestnut, with a narrow frontal and lateral black border; broad superciliaries straw yellow; sides of the head greenish dusky, the auriculars more greenish, with faint whitish mottling; throat dull yellowish white, flecked with dusky; under parts pale yellow (straw yellow), the breast and sides shaded with buffy olive, becoming dark olive buff on the flanks; feet and bill pale horn brown (in skin).

Measurements.—Female type: Wing, 57; tail, 55; bill, 11; tarsus, 20.5.

Range.—Subtropical Zone, eastern Panama (Mount Pirri).

Remarks.—Described originally as a subspecies of *B. melanogenys*, this form appears upon comparison to be worthy of full specific rank. Its color-pattern is the same, but the yellow superciliaries, broadening out in front so as to take up most of the forehead, the more greenish sides of the head, with the dark area more restricted and far less conspicuous, and the yellowish under parts, are characters which definitely mark it off from *melanogenys*. Its range is just as definitely cut off from that of *melanogenys* by the low country of Panama, since both are species of the Subtropical Zone. It is known at present from the type alone.

Specimens examined.—Panama: Mount Pirri (near head of Rio Limon, at 5,200 feet), 1 (the type).

BASILEUTERUS BENSONI Griscom

Basileuterus bensoni GRISCOM, Amer. Mus. Nov. No. 280, 1927, p. 12 (Chitrá, 4,700 feet, Veragua, Panama; type in coll. Amer. Mus. Nat. Hist.).

Description.—Pileum chestnut, with a narrow lateral border of black, meeting on the forehead, and tending to spread over the nape; wide superciliaries pure white; sides of the head black; upper parts olivaceous black (No. 1 of Ridgway's "Color Standards"); wings externally and tail more olivaceous (deep olive); chin and maxillary region black, flecked with white; under parts soiled white, the breast and sides heavily shaded with neutral gray, and the flanks washed with deep grayish olive; under wing-coverts grayish; bill horn brown above, pale below; feet horn brown (in skin).

Measurements.—Male (two specimens): Wing, 60–63; tail, 57–58; bill, 11; tarsus, 20.5. Female (two specimens): Wing, 57–60; tail, 51–56; bill, 10–10.5; tarsus, 20.5.

Range.—Subtropical Zone of Veragua, western Panama.

Remarks.—This recent interesting discovery by Mr. Rex R. Benson adds a third member to the group exemplified by *B. melanogenys*, which species was long supposed to be an isolated form, without near allies. *B. bensoni* is in no sense, however, intermediate in its characters between *B. melanogenys* and *B. ignotus*, but represents rather a further development of the former. Its characters are clearly of specific value, although the pattern of coloration is the same as that of *melanogenys*.

Specimens examined.—Panama; Chitrá, Veragua, 4 (including type).

BASILEUTERUS MELANOGENYS EXIMIUS Nelson

Basileuterus melanogenys (not of Baird) SALVIN, Proc. Zool. Soc. London, 1870, p. 183 (Volcan de Chiriqui, Panama).—SALVIN and GODMAN, Biol. Centr.-Amer., Aves, vol. 1, 1881, p. 174, part (Volcan de Chiriqui, Panama).—SHARPE, Cat. Birds Brit. Mus., vol. 10, 1885, p. 398, part (Chiri-

qui, Panama; descr.; refs.).—BANGS, Proc. New England Zool. Club, vol. 3, 1902, p. 60 (Boquete and Volcan de Chiriqui, Panama).—RIDGWAY, Bull. U. S. Nat. Mus., No. 50, vol. 2, 1902, p. 751, part (Panama localities and refs.).

Basileuterus melanogenys eximius NELSON, Smithsonian Misc. Coll., vol. 60, No. 3, 1912, 22 (Boquete [5,000 feet], Panama; orig. descr.; type in coll. Mus. Comp. Zool.).—GOLDMAN, Smithsonian Misc. Coll., vol. 69, No. 5, 1920, p. 42 (faunal range).—GRISCOM, Amer. Mus. Nov. No. 280, 1927, p. 13, in text (crit.).

Subspecific characters.—Similar to *Basileuterus melanogenys melanogenys*, but upper parts averaging duller, less decidedly olivaceous, and under parts less buffy, more whitish.

Measurements.—Male (seven specimens): Wing, 59–65 (average, 63); tail, 57–64 (60); bill, 9.5–10.5 (10); tarsus, 22–23 (22.5). Female (six specimens): Wing, 58–64 (61); tail, 55–61 (58); bill, 10–10.5 (10); tarsus, 22–23 (22.7).

Range.—Highlands of western Panama.

Remarks.—*Basileuterus melanogenys eximius* is not a strongly marked race, but is discernible in comparison of series. The describer had only the type and one other specimen, both of which are more grayish above than Costa Rican skins, but a larger series fail to emphasize this feature, and many examples are scarcely or not distinguishable in this respect. Specimens were taken in Chiriqui by Arcé not long after von Frantz secured his in Costa Rica, but the Chiriqui bird was not recognized as racially distinct until Doctor Nelson examined some of those collected by Mr. W. W. Brown in 1901.

Specimens examined.—Panama: Volcan de Chiriqui, 7; Boquete, 8 (including type). Total, 15.

BASILEUTERUS MELANOGENYS MELANOGENYS Baird

Basileuterus melanogenys BAIRD, Rev. Amer. Birds, 1865, p. 247 (diag.), p. 248 [San José?], Costa Rica; orig. descr.; type in coll. U. S. Nat. Mus.).—LAWRENCE, Ann. Lye. Nat. Hist. N. Y., vol. 9, 1868, p. 95 (San José, Costa Rica).—SALVIN and GODMAN, Biol. Centr.-Amer., Aves, vol. 1, 1881, p. 174, part, pl. 10, fig. 3 (San José and Volcano Irazú, Costa Rica; descr.; Costa Rican references).—SHARPE, Cat. Birds Brit. Mus., vol. 10, 1885, p. 398, part (Irazú district, Costa Rica).—ZELEDON, An. Mus. Nac. Costa Rica, vol. 1, 1887, p. 107 (La Palma de San José, Costa Rica).—CHERRIE, Proc. U. S. Nat. Mus., vol. 14, 1891, p. 528 (descr. young).—RIDGWAY, Bull. U. S. Nat. Mus., No. 50, vol. 2, 1902, p. 751, part (descr.; Costa Rican localities and refs.).—FERRY, Field Mus. Orn. Ser., vol. 1, 1910, p. 277 (Coliblanco and Volcano Turrialba, Costa Rica).—CARRIKER, Ann. Carnegie Mus., vol. 6, 1910, p. 796 (Costa Rican localities and refs.; crit.; habits).

Description.—Pileum chestnut, inclosed by two lateral narrow lines of black, meeting on the forehead, and widening on the nape; con-

spicuous superciliaries white; lores and sides of the head black; upper parts brownish olive, the wings and tail externally similar but lighter in color, more buffy olive; throat pale buffy whitish, more or less mottled with blackish towards the chin; rest of under parts pale buffy, most decided posteriorly, the breast and sides more or less shaded with deep grayish olive, passing into ecru olive on the flanks; under wing-coverts buffy white; "iris hazel; feet dusky flesh-color; bill brownish black above, flesh-color below."

Juvenal plumage: Above rich brown (between Prout's brown and mummy brown); faint superciliaries paler, more buffy; wings and tail externally dull olivaceous, the middle and greater wing-coverts tipped with rusty buff; below buckthorn brown, the belly buffy medially, the throat more grayish.

Measurements.—Male: Wing, 61–67 (average, 65); tail, 58–64 (61.5); bill, 10–11 (10.5); tarsus, 22–23.5 (23). Female: Wing, 58–64; (60); tail, 55–62 (58.5); bill, 9.5–11 (10.3); tarsus, 21–23 (22).

Range.—Highlands of Costa Rica.

Remarks.—This species belongs to an isolated group, which is possibly distantly related to *B. belli*, and has a somewhat analogous altitudinal range, which according to Mr. Carriker extends "from about 6,000 feet nearly if not quite up to timber-line on the high volcanoes." It is an inhabitant of the low trees and underbrush of the heavy forest of these parts, and is somewhat wrenlike in its habits.

Baird's appropriate name for the species has fortunately escaped synonyms. Mr. Carriker thinks that his type specimen could not possibly have come from San José, but from some higher elevation.

Specimens examined.—Costa Rica: La Estrella de Cartago, 5; Quebradilla de Azahar, 3; Azahar de Cartago, 8; "San José," 2 (including type); El Roble, Volcano Irazú, 1; Volcano Irazú, 26; Las Vuel-tas, 2; Volcano Turrialba, 7; Coliblanco, 2; Lagunaria, Santa Maria de Dota, 2; El Copey, 2; La Palma, 1; Alto, Poas, 1; Ujuras de Terraba, 8; unspecified, 3. Total, 73.

BASILEUTERUS BELLI BELLI (Giraud)

Muscicapa belli GIRAUD, Sixteen Species Texas Birds, 1841, pl. 4, fig. 2 and text ("Texas"; orig. descr.; type in coll. U. S. Nat. Mus.).

Basileuterus chrysophrys BONAPARTE, Consp. Avium, vol. 1, 1850, p. 314 Real Ariba, Mexico; orig. descr.; type in coll. Berlin Mus.).—SCLATER, Proc. Zool. Soc. London, 1857, p. 202 (Jalapa, Vera Cruz; descr.).

Basileuterus belli SCLATER, Proc. Zool. Soc. London, 1855, p. 65 (syn.; crit.).—BAIRD, Rept. Pacific R. R. Survey, vol. 9, 1858, p. 305 (refs.).—SCLATER, Proc. Zool. Soc. London, 1859, p. 374 (Llano Verde and Totontepec, Oaxaca; refs.).—BAIRD, Rev. Amer. Birds, 1865, p. 248 (diag.), p. 250, part (Orizaba, Vera Cruz; descr.; refs.).—SUMICHRIST, Mem. Boston Soc. Nat. Hist., vol. 1, 1869, p. 546 (Temperate Region, Vera Cruz).—BAIRD, BREWER, and RIDGWAY, Hist. N. Amer. Birds, vol. 1,

1874, p. 313, part (Mexico; diag.).—SALVIN and GODMAN, Biol. Centr.-Amer., Aves, vol. 1, 1881, p. 174, part (Mexican localities and refs.; descr.; range, etc.).—SHARPE, Cat. Birds Brit. Mus., vol. 10, 1885, p. 395, part (Mexican localities and refs.; descr.).—NELSON, Auk, vol. 15, 1898, p. 159 (Chilpancingo, Guerrero; San Sebastian, Jalisco); vol. 17, 1900, p. 268, in text (Mt. Zempoaltepec, Oaxaca; meas.).—COOKE, Auk, vol. 22, 1905, p. 299 (range).—AMERICAN ORNITHOLOGISTS' UNION COMMITTEE, Auk, vol. 25, 1908, p. 354 (no valid Texas record).—SMITH, Condor, vol. 11, 1909, p. 61 (Cuernavaca, Morelos; habits).

Basileuterus belli SCLATER, Cat. Amer. Birds, 1861, p. 35 (Orizaba, Vera Cruz; refs.); Proc. Zool. Soc. London, 1865, p. 283, excl. syn. part (refs.; diag.; range).

Basileuterus belli belli RIDGWAY, Bull. U. S. Nat. Mus., No. 50, vol. 2, 1902, p. 743 (descr.; range, refs.).—PHILLIPS, Auk, vol. 28, 1911, p. 86 (Montelunga, Rampahuila, Carricitos, and Galindo, Tamaulipas).—STONE, Auk, vol. 36, 1919, p. 469 (Giraud's ref.).

Basileuterus belli clarus RIDGWAY, Bull. U. S. Nat. Mus., No. 50, vol. 2, 1902, p. 745 (Mountains near Chilpancingo, Guerrero; orig. descr.; type in coll. U. S. Nat. Mus.).

Description.—Above, including wings and tail externally. dull green (between olive green and warbler green); center of the crown chestnut, with lateral marginal stripes of black, meeting each other on the forehead; broad superciliary stripe lemon chrome; sides of the head below the superciliaries chestnut, sometimes inclining to blackish on the lores; malar region and under parts lemon yellow, with more or less shading of pyrite yellow on the sides and flanks, the chin whitish; under wing-coverts dull yellowish white; bill brownish black; feet pale (in skin).

The sexes are alike. The black stripes on the pileum are irregular in outline, and are not well marked in some specimens.

Juvenal plumage: "above, including pileum, superciliary region, and lores. plain sepia or bister brown; the remiges and rectrices olive-green. as in adults; middle and greater wing-coverts tipped with light fulvous or cinnamon-buff, producing two rather distinct bands across wing; sides of head (except lores) plain olive, gradually fading into paler olive on throat and chest, this passing into tawny olive or raw umber on sides and flanks; abdomen, anal region, and under tail-coverts pale yellow (straw yellow)" (Ridgway).

Measurements.—Male: Wing, 56–64 (average, 60); tail, 52–59 (56); bill, 9.5–10.5 (10); tarsus, 20–22 (21). Female (six specimens): Wing, 57–62 (58.5); tail, 53–61 (58); bill, 10–11 (10.5); tarsus, 20.5–23.5 (21).

Range.—Highlands of southern Mexico, from Jalisco and Tamaulipas south to Oaxaca.

Remarks.—"This species, again, was described in 1840 [1841] by Giraud as from Texas, but has not since been found nearly so far north; so that this locality requires further confirmation. The first

specimens ever obtained were doubtless those in the Berlin Museum, sent from Real Ariba and Lagunas by Deppe before the year 1830, to which Lichtenstein attached, unfortunately in manuscript only, the appropriate name of *Sylvia chrysophrys*. This name remained unpublished until Bonaparte used it in his 'Conspectus,' in 1850, too late for adoption, as Mr. Selater long ago pointed out.⁸

Few of the numerous references in the literature, as in part listed above, have really added anything to our knowledge of this species. Giraud's type specimen is now much faded; the color of the upper parts, however, is darker than in fresh specimens. There is no ground for believing that it could have come from "Texas," as Giraud claimed. I therefore suggest that the type locality be fixed as Mount Orizaba, Vera Cruz, whence came the specimens collected by Botteri. Later collectors have traced it northward to Tamaulipas, southward to Oaxaca, and on the Pacific side even to Jalisco. Mr. Ridgway, in his great work on the "Birds of North and Middle America," undertook to separate these Pacific birds under the name *clarus*, but I fail to discover any real differences between specimens from Vera Cruz on the one hand and Guerrero on the other, after handling the same material as he did.

The Bell Warbler appears to belong to the zone called by Sumichrast in Vera Cruz the "Temperate Region," and to be an inhabitant of low brush and thickets, where it has much the habits of the Maryland yellowthroat. Nothing appears to be on record concerning its nest and eggs.

Specimens examined.—"Texas": 1 (type of species). Mexico: Jalapa, Vera Cruz, 2; Mount Orizaba, Vera Cruz, 4; Jico, Vera Cruz, 1; Carricitos, Tamaulipas, 2; Galindo, Tamaulipas, 1; Montalunga, Tamaulipas, 2; Mount Zempoaltepec, Oaxaca, 4; Reyes, Oaxaca, 1; Mount Tancitaro, Michoacan, 1; Huitzilac, Morelos, 1; Mountains near Chilpancingo, Guerrero, 3 (including type of *B. b. clarus*); Omilteme, Guerrero, 2; San Sebastian, Jalisco, 1; Ajusco, Mexico, 1; unspecified, 2. Total, 29.

BASILEUTERUS BELLI SCITULUS Nelson

Basileuterus belli (not *Muscicapa belli* Giraud) SALVIN and SCLATER, Ibis, 1860, p. 31, excl. syn. (Coban, Guatemala).—BAIRD, Rev. Amer. Birds, 1865, p. 250, part (Coban, Guatemala).—BAIRD, BREWER, and RIDGWAY, Hist. N. Amer. Birds, vol. 1, 1874, p. 313, part (Guatemala, in range).—BOUCARD, Ann. Soc. Linn. Lyon, n. s., vol. 25, 1878, p. 40 (Guatemala).—SALVIN and GODMAN, Biol. Centr.-Amer., Aves, vol. 1, 1881, p. 174, part (Guatemalan localities and refs.; habits, etc.).—SHARPE, Cat. Birds Brit. Mus., vol. 10, 1885, p. 395, part (Guatemalan localities and refs.).

⁸ Salvin and Godman, Biología Central-Americana, Aves, vol. 1, 1881, p. 174.

Basileuterus belli scitulus NELSON, Auk, vol. 17, 1900, p. 268 (Todos Santos, Guatemala; orig. descr.; type in coll. U. S. Nat. Mus.).—RIDGEWAY, Bull. U. S. Nat. Mus., No. 50, vol. 2, 1902, p. 744 (descr.; range; refs.).

Subspecific characters.—Similar to *Basileuterus belli belli*, but upper parts darker, olive green, and under parts less decidedly and extensively yellow, with more greenish shading.

Measurements.—Male (five specimens): Wing, 63–65 (average, 64.5); tail, 59–62 (60); bill, 10–10.5 (10.4); tarsus, 21–22 (21.5). Female (one specimen): Wing, 61; tail, 59; bill, 11; tarsus, 21.

Range.—Highlands of Guatemala.

Remarks.—A slightly differentiated form, barely separable by the characters above assigned, none of the others ascribed appearing to hold. The under parts, in fact, are *less* yellow, if anything, not more. Its range is confined to Guatemala and the adjoining parts of Mexico, in the State of Chiapas.

Specimens examined.—Mexico: San Cristobal, Chiapas, 2. Guatemala: Todos Santos, 2 (including type); Calderas, Volcan de Fuego, 3; Uspantan-Quiche, 1; unspecified, 1. Total, 9.

BASILEUTERUS DELATRII MESOCHRYsus Sclater

Basileuterus brunneiceps (not *Setophaga brunneiceps* Lafresnaye and D'Orbigny) BONAPARTE. *Conn. Avium*, vol. 1, 1850, p. 314 ("Bogotá," Colombia; diag.).

Basileuterus delatirii (not of Bonaparte) SCLATER, *Proc. Zool. Soc. London*, 1855, p. 144 ("Bogotá," Colombia; diag.; crit.).—CHERRIE, *Expl. Zool. Costa Rica*, vol. 1, Aves, 1893, p. 14 (Buenos Aires and Boruca, Costa Rica; local range).

Basileuterus mesochrysus SCLATER, *Proc. Zool. Soc. London*, 1860, p. 251, in text ("Bogotá," Colombia; orig. descr.; type in coll. Brit. Mus.).—BAIRD, *Rev. Amer. Birds*, 1865, p. 250, part ("Bogotá," Colombia; refs.).—SCLATER, *Proc. Zool. Soc. London*, 1865, p. 284 (refs.; diag.; range).—SALVIN, *Proc. Zool. Soc. London*, 1867, p. 136 (Santa Fé, Veragua; refs.; crit.); 1870, p. 183 (Chitrá and Calobre, Veragua).—WYATT, *Ibis*, 1871, p. 323 (Herradura and Cocuta Valley, Colombia).—SALVIN and GODMAN, *Ibis*, 1879, p. 198 (Manaure, Colombia; crit.); 1880, p. 117 (Chirua, Colombia).—SALVIN and GODMAN, *Biol. Centr.-Amer.*, Aves, vol. 1, 1881, p. 176, part (Panama and Colombia refs. and localities; descr.; range; crit.).—VON BERLEPSCH, *Journ. f. Orn.*, vol. 32, 1884, p. 282 (Bucaramanga and "Bogotá," Colombia; Wyatt's record; crit.).—SHARPE, *Cat. Birds Brit. Mus.*, vol. 10, 1885, p. 396, part (Panama and Colombia localities and refs.; descr.; crit.).—BANGS, *Proc. Biol. Soc. Washington*, vol. 12, 1898, p. 144 ("Santa Marta," Colombia), p. 180 (Palomina, Colombia).—ALLEN, *Bull. Amer. Mus. Nat. Hist.*, vol. 13, 1900, p. 176 (Bonda, Minca, and Cacagualito, Colombia).

Basileuterus delatirii (emendation ?) LAWRENCE, *Ann. Lyc. Nat. Hist. N. Y.*, vol. 7, 1861, p. 322 (Panama R. R.).

Basileuterus delatirii mesochrysus CHERRIE, *Proc. U. S. Nat. Mus.*, vol. 14, 1891, p. 342 (crit.; range).—TODD and CARRIKER, *Ann. Carnegie Mus.*, vol. 14, 1922, pp. 65, 439 (Santa Marta localities and refs.; plum.; range; crit.).

Basileuterus rufifrons mesochrysus RIDGWAY, Bull. U. S. Nat. Mus., No. 50, vol. 2, 1902, p. 750 (descr.; range; refs.).—THAYER and BANGS, Bull. Mus. Comp. Zool., vol. 46, 1906, p. 221 (Savanna of Panama).—BANGS, Proc. Biol. Soc. Washington, vol. 22, 1909, p. 36 (Buenos Aires, El General, and Boruca, Costa Rica; range; crit.).—CARRIKER, Ann. Carnegie Mus., vol. 6, 1910, p. 797 (Costa Rican localities and refs.; range; habits).—CHAPMAN, Bull. Amer. Mus. Nat. Hist., vol. 36, 1917, p. 553 (near Honda, Chicoral, and below Andalucia, Colombia; Colombian refs.).—STONE, Proc. Acad. Nat. Sci. Philadelphia, 1918, p. 274 (Gatun and Pedro Miguel, Panama).—GOLDMAN, Smithsonian Misc. Coll., vol. 69, No. 5, 1920, p. 30 (Panama; faunal range).—HALLINAN, Auk, vol. 41, 1924, p. 324 (Valley Rio Algarrobo, Sosa Hill, and Farfan, Panama; food).

Basileuterus rufifrons delatirii BANGS, Auk, vol. 24, 1907, p. 306 (Boruca and Paso Real, Costa Rica).

Subspecific characters.—Similar to *Basileuterus delatirii delatirii*, but back lighter (more yellowish) olive green; gray nuchal band more conspicuous; under parts purer yellow, with less greenish shading on the sides and flanks; white maxillary and mental spots larger, usually continuous with the suborbital spot; and tail shorter.

Measurements.—Male: Wing, 54–61 (average, 57.5); tail, 50–54 (52); bill, 10–11 (10.5); tarsus, 19–21 (20). Female: Wing, 53–59 (55.5); tail, 45–53 (50.5); bill, 9.5–11 (10.5); tarsus, 19–21 (19.8).

Range.—Southwestern Costa Rica through Panama to the Magdalena Valley and Santa Marta region of Colombia, in the Tropical Zone.

Remarks.—Sclater at first confused this form with *delatirii* of Bonaparte, but soon recognized its characters and described it in an informal way in 1860. As first suggested by Mr. Cherrie, it is clearly conspecific with *delatirii*, and like that form is a Tropical Zone bird, not going above 4,000 feet elevation. Oddly enough, there are no records for western Colombia, or even for the lower Atrato Valley, but it is apparently a common species in the Santa Marta region as well as in the Magdalena Valley, which latter must have been the actual source of the type specimen, and not "Bogotá."

Specimens examined.—Costa Rica: Boruca, 15; Buenos Aires, 6; El General, 18; Paso Real, Boruca, 1. Panama: Boqueron, Chiriqui, 1; Panama, 5; Balboa, 2; Farfan, 1; Gatun, 1; Colon, 1; Chitrá, Veragua, 1; "Porto Bello Trail, Continental Divide," 1; unspecified, 5. Colombia: Cacagualito, 5; Bonda, 3; Minca, 16; Agua Dulce, 1; Mamatoco, 3; Cincinnati, 1; La Tigrera, 10; Pueblo Viejo, 2; San Antonio, 1; La Concepción, 12; Palomina, 7; San Francisco, 1; Santa Marta Mountains, 5; Aguachica, 1; El Cauca, 7; El Tambor, 1; Mariquita, 1; Andalucia (3,000 feet), 9; Chicoral, Coello River (1,800 feet), Tolima, 3; within 20 miles of Honda, Tolima, 1; Cunday, 1; "Bogotá," 13. Total, 159.

***BASILEUTERUS DELATRII DELATRII* Bonaparte**

Basileuterus delatirii BONAPARTE, Compt. Rend., vol. 38, 1854, p. 383 (Nicaragua; orig. descr.; type in coll. Paris Mus. [?]).—SCLATER and SALVIN, Ibis, 1860, p. 274 (Dueñas, Guatemala).—SOLATER, Proc. Zool. Soc. London, 1865, p. 284, part (refs.; Guatemala, in range).—SALVIN, Proc. Zool. Soc. London, 1867, p. 136, in text (Guatemala; crit.).—SALVIN and GODMAN, Biol. Centr.-Amer., Aves, vol. 1, 1881, p. 176, part (Guatemalan localities and refs. [part]; descr.; crit.).—SHARPE, Cat. Birds Brit. Mus., vol. 10, 1885, p. 396, excl. syn. part (Calderas, La Trinidad, and Volcan de Agua, Guatemala; descr.; refs.).—CHERRIE, Proc. U. S. Nat. Mus., vol. 14, 1891, p. 340 (range; crit.), p. 527 (San José, Costa Rica; descr. young).—CHERRIE, Auk, vol. 9, 1892, p. 22 (San José, Costa Rica; descr. nest and eggs).—SALVIN and GODMAN, Ibis, 1892, p. 326 (Matagalpa and Chinandega, Nicaragua; Guatemalan localities [part]; crit.).

Basileuterus delatirei CABANIS, Journ. f. Orn., vol. 8, 1860, p. 325 (Costa Rica; crit.).—LANTZ, Trans. Kansas Acad. Sci., "1896-97," 1899, p. 223 (near Granada, Nicaragua).

Basileuterus mesochrysus (not of Sclater) BAIRD, Rev. Amer. Birds, 1865, p. 248 (diag.), p. 250, part (San José, Costa Rica; descr.; refs.; crit.).—LAWRENCE, Ann. Lyc. Nat. Hist. N. Y., vol. 9, 1868, p. 95 (San José, Grecia, and Guatitil, Costa Rica).—VON FRANTZIUS, Journ. f. Orn., vol. 17, 1869, p. 294 (San José, Costa Rica).—BOUCARD, Proc. Zool. Soc. London, 1878, p. 52 (San José and Cartago, Costa Rica).—SALVIN and GODMAN, Biol. Centr.-Amer., Aves, vol. 1, 1881, p. 176, part (San José, Guatitil, Grecia, and Irazú, Costa Rica; refs.; crit.).—RIDGWAY, Proc. U. S. Nat. Mus., vol. 5, 1883, p. 499 (San José, Costa Rica).—SHARPE, Cat. Birds Brit. Mus., vol. 10, 1885, p. 396, part (Grecia and Irazú, Costa Rica).—ZELEDON, An. Mus. Nac. Costa Rica, vol. 1, 1887, p. 107 (San José, Alajuela, Naranjo de Cartago, Grecia, and Monte Redondo, Costa Rica).—UNDERWOOD, Ibis, 1896, p. 434 (Miravalles, Costa Rica).

Basileuterus rufifrons delatirii RIDGWAY, Bull. U. S. Nat. Mus., No. 50, vol. 2, 1902, p. 749 (descr.; range; refs.).—DEARBORN, Field Mus. Orn. Ser., vol. 1, 1907, p. 131 (Patulul and Lake Amatitlan, Guatemala; crit.).—BANGS, Proc. Biol. Soc. Washington, vol. 22, 1909, p. 36, in text (Tenorio and Cerro Sta. Maria, Costa Rica; range).—CARRIKER, Ann. Carnegie Mus., vol. 6, 1910, p. 798 (Costa Rican localities and refs.; range).—FERRY, Field Mus. Orn. Ser., vol. 1, 1910, p. 277 (Guayabo, Costa Rica; crit.).

Description.—Pileum and auriculars clear bay, separated from each other by a broad white superciliary stripe; rest of upper parts olive green, sometimes grayish-tinged on the nape; wings and tail dusky, with narrow outer margins of olive green; lores, circumocular and postocular regions dusky black, except for a white spot below the eye; chin and sometimes a short maxillary spot whitish; under parts lemon yellow, with more or less shading of warbler green on the sides and flanks; under wing-coverts light yellow; inner margins of remiges whitish below; "iris brown; feet dusky flesh-color; bill black" (Carriker).

Young in juvenal dress are dull brownish olive above and on the breast, the abdomen buffy yellowish; wing-coverts tipped with buffy;

the pale spot on the chin indicated, but the superciliaries faintly marked or obsolete.

Measurements.—Male: Wing, 53–59 (average, 56); tail, 51–58 (54.5); bill, 9.5–10.5 (10.3); tarsus, 18.5–20.5 (20). Female: Wing, 51–56 (54); tail, 49–56 (52.5); bill, 9.5–10.5 (10.2); tarsus, 19–20.5 (20).

Range.—Southern Guatemala to Costa Rica (except southwestern part).

Remarks.—Bonaparte's type probably came from western Nicaragua, although the authors of the "Biologia Centrali-Americana" express some doubts on this point. In Costa Rica it is found in the eastern and northern parts of the country, everywhere in fact (within its zonal limits) except in the extreme southwestern part, in the Ter-raba Valley. Salvin and Godman extended its known range to Guatemala, but at first confused it with "*B.*" *rufifrons* and "*B.*" *salvini*, so that Mr. Ridgway was lead to place all their records from that country under the latter form. That this was a mistake is evident from an examination of the specimens in the collection of the British Museum on which these records were based. The localities represented are Calderas, La Trinidad (both on the Volcan de Fuego), and Volcan de Agua, the specimens being perfectly typical of *delatirii*. More recently Doctor Dearborn has recorded this species from Patulul and Lake Amatitlan, in the same general region. Since "*B.*" *rufifrons rufifrons* is known from Lake Atitlan and Dueñas it is clear that *delatirii* and *rufifrons* can not possibly be geographical races of one species, since their respective ranges meet while their characters continue constant, the two remaining perfectly distinct. *B. delatirii* may always be known from "*B.*" *rufifrons* by its relatively shorter tail (shorter than the wing instead of longer), its completely and more uniformly yellow under parts, and by its wholly rufous auriculars, without any white band or streak below. The chestnut of the pileum is rather darker, too, and shows no tendency to division in the middle by a paler streak, as is so often the case in "*B.*" *rufifrons*. For all the close external resemblance between these two forms, I am inclined to separate them generically.

Specimens examined.—Guatemala: Lake Amatitlan, 2; Patulul, Solola, 7; Volcan de Agua, above San Diego, 1; Calderas, Volcan de Fuego, 1; La Trinidad, Volcan de Fuego, 1. Nicaragua: Rio Coco (Wanks River), 1; Muy Muy, 1; Volcan Viejo, Chinandega, 2; Volcan de Chinandega, 3; Las Canas (6 miles E. of Matagalpa), 2,500 feet, 1; Matagalpa, 3; Leon, 1. Costa Rica: San José, 39; Cartago, 3; Guayabo, 10; Santa Maria de Dota, 1; Cerro Santa Maria, 1; Tenorio, 8; Miravalles, 3; Bebedero, 1; San Juan, 1; Monte

Redondo, 1; Monte Aguacate, 1; San Sebastian, 1; Juan Viñas, 5; Esparta, 1; Aquinares, 5; Agua Caliente, 1; unspecified, 1. Total, 108.

Genus *IDIOTES* Baird

Idiotes BAIRD, Rev. Amer. Birds, 1865, p. 247 (diag.; type, by original designation, *Setophaga rufifrons* Swainson).

Generic characters.—Similar to *Basileuterus* Cabanis, but bill relatively shorter, and tail relatively longer, exceeding the wing in length, and composed of narrowed rectrices.

Remarks.—Baird included several other Middle American species in this group besides the type, but if restricted to the latter it becomes possible to recognize it to some advantage, while its elimination from *Basileuterus* enables a tighter definition for that group. It is, however, closely related to *Basileuterus delatirii*, so closely indeed that Mr. Ridgway made its type conspecific with the latter. As shown beyond, however, there appears to be no real connection between the two. The single species comprising this group is peculiar to Mexico and Guatemala, where it has become split up into a number of geographical races.

IDIOTES RUFIFRONS SALVINI (Cherrie)

Basileuterus delatirii (not of Bonaparte) SCLATER, Cat. Amer. Birds, 1861, p. 35, excl. syn. (Mexico).—BAIRD, Rev. Amer. Birds, 1865, p. 249, excl. syn. part (Coban, Guatemala; descr.; crit.).—SALVIN and GODMAN, Biol. Centr.-Amer., Aves, vol. 1, 1881, p. 176, part (Coban and Cahabon, Guatemala).—SHARPE, Cat. Birds Brit. Mus., vol. 10, 1885, p. 396, part (Coban, Guatemala).

Basileuterus rufifrons (not *Setophaga rufifrons* Swainson) SHARPE, Cat. Birds Brit. Mus., vol. 10, 1885, p. 397, part (Coban and Cahabon, Guatemala).

Basileuterus salvini CHERRIE, Proc. U. S. Nat. Mus., vol. 14, 1891, p. 342 (Coban, Vera Paz, Guatemala; orig. descr.; type in coll. U. S. Nat. Mus.).—SALVIN and GODMAN, Ibis, 1892, p. 326, in text (range; crit.).

Basileuterus flavigaster NELSON, Auk, vol. 14, 1897, p. 67 (Yajalon, Chiapas, Mexico; orig. descr.; type in coll. U. S. Nat. Mus.).

Basileuterus rufifrons salvini RIDGWAY, Bull. U. S. Nat. Mus., No. 50, vol. 2, 1902, p. 749 (descr.; range; refs.).—DEARBORN, Field Mus. Orn. Ser., vol. 1, 1907, p. 131, in text (crit.).

Basileuterus rufifrons flavigaster RIDGWAY, Bull. U. S. Nat. Mus., No. 50, vol. 2, 1902, p. 748 (descr.; range; refs. [part]).

Subspecific characters.—Similar to *Idiotes rufifrons rufifrons*, but with the yellow of the breast more extended posteriorly, often covering the entire under parts, with a buffy wash on the flanks and crissum.

Measurements.—Male (nine specimens): Wing, 51–57 (average, 54); tail, 53–57 (55); bill, 9–11 (10); tarsus, 20–22 (21). Female

(six specimens): Wing, 48-54 (51); tail, 52-57 (54); bill, 9.5-10.5 (10); tarsus, 20-21 (20.5).

Range.—Southeastern Mexico, from southern Vera Cruz southward through Tabasco and Chiapas to Vera Paz, Guatemala.

Remarks.—Slater's 1861 record of *Basileuterus* "*delatirii*" from Mexico must have been based on an example of this well-marked race, since *delatirii* does not range into that country. Baird in 1865, with a single example from Coban, Vera Paz, Guatemala, before him, again misidentified it with *B. delatirii*. Salvin and Godman, writing in 1881, placed their entire series from Guatemala under the same form, but were confused over certain discrepancies in coloration, which they were inclined to ascribe to differences in age. In 1885, however, we find Sharpe dividing the Guatemalan series between *B. delatirii* and "*B.*" *rufifrons*, one specimen from Coban falling with the former and two others from the same place with the latter. In 1892 Mr. Cherrie called attention to the peculiarities of the single Guatemalan specimen examined by him (also from Coban, and the same one that Baird had handled), which he thereupon proceeded to describe as a new species, "*B.*" *salvini*. The same year Salvin and Godman again returned to the question, and indorsed Mr. Cherrie's views as to the validity of *salvini*, the range of which they extended to Tabasco, Mexico. Again in 1897 Mr. Nelson undertook to separate the bird of this latter region under the name *flavigaster*, his type coming from Yajalon, Chiapas. He compared his new form directly with "*B.*" *rufifrons*, without referring to *salvini*. Mr. Ridgway, with the types of *salvini* and *flavigaster* before him in 1902, called attention to their close resemblance, while admitting both alleged forms to recognition as races of "*B.*" *rufifrons*. He was puzzled by the occurrence in Guatemala of birds representing both types, and thought that *salvini* might represent the resident race, and the other a migrant race.

With all the material before me that Mr. Ridgway had (which by itself was admittedly inconclusive), and much more, my findings are that there are only two forms of the *rufifrons* type in Guatemala, *salvini* and another which for the present I refer to true *rufifrons*. Through the courtesy of the authorities of the British Museum (Natural History) I have been permitted to examine two additional specimens in their collection from Coban, the type locality of *salvini*. (One of these is listed under *B. delatirii* in the "Catalogue of Birds," as already noted.) These specimens fail to bear out the supposed distinctive characters of *salvini* as compared with *flavigaster*. They agree sufficiently well with Mexican specimens of the latter, and with a series of nine specimens in the collection of Dr. Jonathan Dwight from Finca Sepecuite and Secanquim, situated in the region between

Coban and Lake Yzabal. Hence *flavigaster* is a synonym of the earlier *salvini*, which ranges northward from Vera Cruz in Guatemala to the Mexican State of Vera Cruz, where it probably intergrades with *I. rufifrons jouyi*. Of four birds from San Andres Tuxtla, Vera Cruz, only one is typical, the other three being more or less intermediate towards *jouyi*. A few miles west of Coban, at a place called Finca la Primavera, true *rufifrons* occurs, and again at Lake Atitlan, in the southwestern part of the country, so that the ranges of the two forms approximate each other here, without any signs of intergradation taking place.

The coloration of *I. rufifrons salvini*, resembling as it does that of *Basileuterus delatirii*, seems to have induced Mr. Ridgway to unite the two groups represented, respectively, by *rufifrons* and *delatirii* under one specific heading, making them conspecific. According to my views they are not even congeneric. The relatively long tail of *salvini*, with narrowed rectrices, its short, more rounded bill, and the white line under the auriculars, separate it definitely from *B. delatirii* and align it with *I. rufifrons*. There is absolutely no indication of intergradation between *rufifrons* and *delatirii* where their respective ranges approximate.

Specimens examined.—Guatemala: Coban, Vera Paz, 3 (including type); Cahabon, 1 (not typical); Finca Sepecuite, 5; Secanquim, 4; unspecified, 5. Mexico: Teapa, Tabasco, 1; Yajalon, Chiapas, 1 (type of "*B.*" *flavigaster* Nelson); San Andres Tuxtla, Vera Cruz, 4; unspecified, 2. Total, 26.

IDIOTES RUFIFRONS RUFIFRONS (Swainson)

Setophaga rufifrons SWAINSON, Anim. in Menag., 1833, p. 294 ("Mexico"; orig. descr.; type in coll. Berlin Mus. [?]).

Basileuterus rufifrons BONAPARTE, Consp. Avium, vol. 1, 1850, p. 314 (Mexico; diag.).—SCLATER, Proc. Zool. Soc. London, 1856, p. 291 ([Cordova?], Vera Cruz); 1858, p. 299 (La Parada, Oaxaca).—BAIRD, Rev. Amer. Birds, 1865, p. 248, part (Jalapa and Mirador, Vera Cruz; descr.; refs.; crit.).—SCLATER, Proc. Zool. Soc. London, 1865, p. 284 (refs.; diag.; range).—SALVIN, Proc. Zool. Soc. London, 1867, p. 136, in text (range).—SUMICHRIST, Mem. Boston Soc. Nat. Hist., vol. 1, 1869, p. 546 (Temperate Region, Vera Cruz).—LAWRENCE, Bull. U. S. Nat. Mus., No. 4, 1876, p. 16 (Guichicovi, Chiapas).—SALVIN and GODMAN, Biol. Centr.-Amer., Aves, vol. 1, 1881, p. 175, part (S. Mexico and Guatemala [part] localities and refs.; descr.; crit.).—SHARPE, Cat. Birds Brit. Mus., vol. 10, 1885, p. 397, excl. syn. part (Jalapa, Vera Cruz, and Cinco Señores, Oaxaca; Dueñas, Guatemala; descr.; refs.).—RIDGWAY, Proc. U. S. Nat. Mus., vol. 15, 1892, p. 119, in text (Mirador and Jalapa, Vera Cruz; Guichicovi, Oaxaca; crit.).—CHAPMAN, Bull. Amer. Mus. Nat. Hist., vol. 10, 1898, p. 25 (Jalapa, Vera Cruz).—TODD and CARRIKER, Ann. Carnegie Mus., vol. 14, 1922, p. 440, in text (crit.).—BERLIOZ, Rev. Franc. d'Orn., vol. 8, 1923, p. 159 (Orizaba, Vera Cruz).

Basileuterus rufifrons rufifrons RIDGWAY, Bull. U. S. Nat. Mus., No. 50, vol. 2, 1902, p. 745 (descr.; range; refs.).

Basileuterus rufifrons dugesi (not of Ridgway) DEARBORN, Field Mus. Orn. Ser., vol. 1, 1907, p. 131 (Panajachel, Lake Atitlan, Guatemala; crit.).

Description.—Pileum chestnut, usually with indications of a paler median stripe, the hindneck and sides of the neck deep olive gray, passing into citrine on the back; superciliary stripe white; loreal and postorbital regions black, connected by a narrow line above the eye; auricular region chestnut; chin and malar region dull white; throat and breast lemon chrome, passing into dull white on the abdomen, more or less shaded with buffy or yellowish, and the sides and flanks shaded with buffy brown; under wing-coverts pale yellow, the edge of the wing brighter; "iris brown; bill black; feet flesh-color."

Juvenal plumage (No. 143,228, Collection U. S. National Museum, Ocuilapa, Chiapas, Mexico, August 27, 1895): Above like the adult, but much duller citrine, the pileum still duller and browner than the back; the superciliary and transocular stripes indicated; under parts dull buffy, anteriorly tinged with yellow.

Measurements.—Male (eight specimens): Wing, 52-56 (average, 53); tail, 54-60 (57); bill, 9-10.5 (9.7); tarsus, 20-21.5 (20.5). Female (six specimens): Wing, 46-53 (49); tail, 51-57 (54); bill, 9-10.5 (9.7); tarsus, 19-21 (20).

Range.—Southern Mexico, from Puebla and central Vera Cruz to Oaxaca and Chiapas, and thence to southern Guatemala.

Remarks.—Swainson's description, brief as it is, clearly applies to this race and to no other. He does not say where his type specimen is to be found, nor does he give any more definite habitat than "Mexico." Specimens collected by Deppe, and deposited in the Berlin Museum, had in the meantime received a manuscript name, "*aurigula*," from Lichtenstein. Salvin and Godman state that Deppe's skins were taken at Real Ariba, in the State of Vera Cruz (?), and largely on this account I propose to designate this as the type locality. It occupies the highlands of southern Mexico, from Vera Cruz to the adjoining State of Puebla, and south to Oaxaca and Chiapas. In the coast region east of Vera Cruz it is replaced by the yellow-bellied race, *I. r. salvini*. Guatemala specimens (listed beyond) are referred here provisionally, but probably represent an undescribed race. Below they are the same as *I. rufifrons jouyi*, but are much greener above. I cannot agree with Doctor Dearborn that they represent winter resident individuals, or in calling them *dugesi*. The worn condition of the specimens, and the date of collection (April 10) forbids such a supposition, in my opinion.

Specimens examined.—Mexico: Jalapa, Vera Cruz, 7; Jico, Vera Cruz, 2; Mirador, Vera Cruz, 4; Pasa Nueva, Vera Cruz, 2 (interme-

diates); Orizaba, Vera Cruz, 2; Huachinango, Puebla, 2; near Tontotepec, Oaxaca, 1; Tuxtepec, Oaxaca, 1; Valley of Jiquipilas, Chiapas, 1; Ocuilapa, Chiapas, 3; Guachicovi, Chiapas, 1; unspecified, 1. Guatemala: Panajachel, Lake Atitlan, 5; Finca la Primavera, 10; Dueñas, 1; Vera Paz, 1. Total, 43.

IDIOTES RUFIFRONS JOUYI (Ridgway)

Basileuterus rufifrons jouyi RIDGWAY, Proc. U. S. Nat. Mus., vol. 15, 1892, p. 119 (Hacienda Angostura, San Luis Potosi; orig. descr.; type in coll. U. S. Nat. Mus.).—JOUY, Proc. U. S. Nat. Mus., vol. 16, "1893," 1894, p. 777, part (same locality; habits).—RIDGWAY, Bull. U. S. Nat. Mus., No. 50, vol. 2, 1902, p. 746 (descr.; range; refs.).—PHILLIPS, Auk, vol. 28, 1911, p. 86 (Galindo, Guiaves, Montelunga, Yerba Burna, Rampahuila, Santa Leonor, and Rio Cruz, Tamaulipas).

Subspecific characters.—Similar to *Idiotes rufifrons caudatus*, but general coloration darker; above darker; yellow of the under parts deeper; posterior under parts less purely white, the shading on the sides and flanks more grayish brown, less buffy. Similar also to *Idiotes rufifrons rufifrons*, but upper parts duller, more grayish, less greenish in tone.

Measurements.—Male: Wing, 51–57 (average, 53); tail, 56–62 (59); bill, 9–10 (9.3); tarsus, 19.5–21 (20). Female: Wing, 50–56 (53); tail, 55–62 (58); bill, 9–9.5 (9.3); tarsus, 19.5–21 (20.3).

Range.—Eastern Mexico, from central Tamaulipas to San Luis Potosi, and south to Hidalgo, northern Puebla, and northern Vera Cruz.

Remarks.—An example in juvenal dress (No. 61,649, Collection Museum of Comparative Zoölogy, Realito, Tamaulipas, June 14, 1909) is dull olive brownish above and dusky buff below, the white superciliaries and dusky postocular spot well marked; the wing-coverts are tipped with buffy.

This is the northeastern race of *Idiotes rufifrons*, ranging from the State of Tamaulipas southward to Vera Cruz, where it meets the typical form. It is easily told from the latter by its more grayish coloration, but is not so far removed from *I. rufifrons caudatus*.

Specimens examined.—Mexico: Rio Cruz, Tamaulipas, 6; Montelunga, Tamaulipas, 4; Santa Leonor, Tamaulipas, 2; Yerba Burna, Tamaulipas, 3; Guiaves, Tamaulipas, 2; Ciudad Victoria, Tamaulipas, 14; Portrero, Tamaulipas, 1; Galindo, Tamaulipas, 12; Realito, Tamaulipas, 3; Rampahuila, Tamaulipas, 4; Tampico, Tamaulipas, 1; Monterey, Nuevo Leon, 6; Cerro de la Silla, Nuevo Leon, 1; Boquilla, Nuevo Leon, 7; San Pedro Minico, Nuevo Leon, 6; Hacienda Angostura, San Luis Potosi, 3 (including type); El Chico, Hidalgo, 1; Tochimilco, Puebla, 1; Maltrata, Vera Cruz, 1; unspecified, 2. Total, 80.

IDIOTES RUFIFRONS DUGESI (Ridgway)

Basileuterus rufifrons (not *Setophaga rufifrons* Swainson) HEINE and REICHENOW, Nom. Mus. Heineani Orn., 1882, p. 14 (Oaxaca, Mexico).

Basileuterus rufifrons dugesi RIDGWAY, Proc. U. S. Nat. Mus., vol. 15, 1892, p. 119, part (Guanajuato, Mexico; orig. descr.; type in coll. U. S. Nat. Mus.); Bull. U. S. Nat. Mus., No. 50, vol. 2, 1902, p. 747, excl. Sinaloa * localities and refs. (descr.; range; refs.).—SMITH, Condor, vol. 11, 1909, p. 61 (Cuernavaca, Morelos; habits).

Basileuterus rufifrons jouyi (not of Ridgway) JOUX, Proc. U. S. Nat. Mus., vol. 16, "1893," 1894, p. 777, part (Barranca Ibarra, Jalisco).

Subspecific characters.—Similar to *Idiotes rufifrons rufifrons*, but general color of upper parts, wings, etc., duller (dark buffy olive).

Measurements.—Male: Wing, 51–55 (average, 52.5); tail, 52–61 (57.4); bill, 9–10.5 (9.5); tarsus, 19.5–21.5 (20.5). Female: Wing, 50–58 (52); tail, 52–59 (56); bill, 9–10 (9.5); tarsus, 19–21 (20).

Range.—Central Mexico, west to Jalisco, and south to Oaxaca.

Remarks.—This is an unsatisfactory form. It is in fact merely the name applied to a series of intergrades between true *rufifrons* of the Vera Cruz region and the pale, grayish, washed-out race of northwestern Mexico. Birds from Oaxaca approach *rufifrons* in their more greenish color above, while those from Jalisco verge more towards *caudatus*, as also does the type, from Guanajuato. Taken as a series, the specimens listed below are barely separable as a namable race, after allowing for differences due to wear. In fact, if the type-specimens of *dugesi*, *caudatus*, and *jouyi* were the only specimens available, I fail to see how these races could be told one from another, but in series they can be roughly separated.

Specimens examined.—Mexico: Tepic, Tepic, 1; Barranca Ibarra, Jalisco, 2; San Sebastian, Jalisco, 3; Talpa, Jalisco, 2; Tuxpan, Jalisco, 7; La Pisagua (near Volcano Tolima), Jalisco, 3; Volcano Tolima, Jalisco, 1; Bolanos, Jalisco, 1; Zapotlan, Jalisco, 1; Guadalajara, Jalisco, 1; Volcan de Fuego, Jalisco, 1; Sal se Puerdes (5,000 feet), Jalisco, 1; Guanajuato, Guanajuato, 1 (type of subspecies); Patzcuaro, Michoacan, 3; Los Reyes, Michoacan, 1; Rio Balsas, Guerrero, 2; El Naranjo, Guerrero, 1; Cuernavaca, Morelos, 1; Oaxaca, Oaxaca, 2; Juquila, Oaxaca, 1; Cuicatlan, Oaxaca, 1. Total, 37.

IDIOTES RUFIFRONS CAUDATUS (Nelson)

Basileuterus rufifrons (not *Setophaga rufifrons* Swainson) BAIRD, Rev. Amer. Birds, 1865, p. 248, part (Sierra Madre, near Mazatlan, Sinaloa).—LAWRENCE, Mem. Boston Soc. Nat. Hist., vol. 2, 1874, p. 270 (Sierra Madre, Sinaloa).—SALVIN and GODMAN, Biol. Centr.-Amer., Aves, vol. 1, 1881, p. 175, part (Sierra Madre, Sinaloa, ex Baird and Lawrence).—ALLEN, Bull. Amer. Mus. Nat. Hist., vol. 5, 1893, p. 41 (Napolera, Chi-huahua).

Basileuterus rufifrons caudatus NELSON, Proc. Biol. Soc. Washington, vol. 13, 1899, p. 29 (near Alamos, Sonora, Mexico; orig. descr.; type in coll. U. S. Nat. Mus.).—RIDGWAY, Bull. U. S. Nat. Mus., No. 50, vol. 2, 1902, p. 748 (descr.; range; refs.).

Basileuterus rufifrons dugesi RIDGWAY, Proc. U. S. Nat. Mus., vol. 15, 1892, p. 119, part (Sierra Madre near Mazatlan, Sinaloa); Bull. U. S. Nat. Mus., No. 50, vol. 2, 1902, p. 747, part (Sinaloa localities and refs.).

Subspecific characters.—Similar to *Idiotes rufifrons dugesi*, but upper parts still duller (near citrine drab), and under parts averaging slightly paler.

Measurements.—Male: Wing, 50–55 (average, 52.5); tail, 55–61 (58.5); bill, 8.5–9.5 (9); tarsus, 19.5–21.5 (20.5). Female: Wing, 48–52 (50.5); tail, 53–60 (56.5); bill, 8.5–9.5 (9); tarsus, 20–21 (20.5).

Range.—Northwestern Mexico, in States of Sonora, Chihuahua, and Sinaloa.

Remarks.—This race is easily told from *I. rufifrons rufifrons*, but is so close to *I. rufifrons dugesi* as to be distinguishable only in series of specimens comparable for season. It is the palest form of the species, reflecting the aridity of its habitat. A juvenal example (No. 21.766, collection William Brewster, Bravo, Chihuahua, July 23, 1888) is very much paler above than the corresponding stage of *I. rufifrons jouyi*.

Specimens from Sinaloa are in my opinion better referred here than to *I. rufifrons dugesi*. The greater length of the tail, supposed by Messrs. Nelson and Ridgway to be diagnostic of this race, is inconsiderable; in fact, comparative measurements of all the forms of the *rufifrons* group of conspecies vary little among themselves.

Specimens examined.—Mexico: Mina Abundancia, Chihuahua, 11; Hacienda de San Rafael, Chihuahua, 10; Carmen, Chihuahua, 4; Jesus Maria, Chihuahua, 4; Bravo, Chihuahua, 8; near Batopilas, Chihuahua, 1; Colonia Garcia (15 miles west of Chihuahua), Chihuahua, 1; near Oposura, Sonora, 4; Alamos, Sonora, 5 (including type); Nopalera, Sonora, 1; Plomosas, Sinaloa, 3; Sierra Madre, near Mazatlan, Sinaloa, 1. Total, 53.

FIVE NEW PARASITIC FLIES REARED FROM BEETLES IN CHINA AND INDIA

By J. M. ALDRICH

Associate Curator, Division of Insects, United States National Museum

The five species of Diptera here described were reared by economic entomologists while searching in the Orient for parasites of injurious beetles, with a view to the introduction of such parasites into the United States and Hawaiian Islands.

Family PYRGOTIDAE

Genus CAMPYLOCERA Macquart

Campylocera MACQUART, Dipt. Exot., vol. 2, pt. 3, 1843, p. 220.

CAMPYLOCERA HIRSUTA, new species

In Hendel's key to the species of this genus¹ the present species would run to *thoracalis*, which however has shining black stripes on the dorsum of the thorax.

Female.—Head entirely brownish yellow, front opaque, near vertex 0.37 of head width. The eyes approximate each other more closely at the middle of the face, where the intervening space is 0.34 of head width. Parafacial shining, about half the width of the third antennal joint; antennal grooves translucent; from the inner edge of the facial ridges a flat opaque slender depressed area extends down around the lower curve of the eye, occupying the greater part of the width of the cheek. Antennae yellow, first joint short, second and third of equal length on upper edge, the third about twice as long as wide. Arista slender, yellow at base; palpi pale yellow, broad. Thorax wholly yellow, shining, with rather dense erect dark hair above, which is paler in some lights. The bristles of the middle of the dorsum and the humeri are not distinguishable from the hairs. There are two distinct notopleural, one supraalar, two postalar, and a single pair of dorsocentral bristles just before the scutellum. The latter has four good-sized marginal bristles and some slender long hairs.

¹ Archiv für Naturgeschichte, vol. 79, 1913, p. 92.

Abdomen yellow, somewhat brownish above, the basal joint much shorter and broader than in *Adapsilia flaviseta*, the remaining segments also shorter. The posterior or apparent sixth segment is nearly twice as long as all the rest of the abdomen, compressed, and at the tip turned downward; the first abdominal segment has a cluster of long hair on each side near its tip; the following segments are more hairy in the middle, while the posterior has dense long hair all over, which becomes a little more delicate apically. All of the hair of the abdomen is brown or blackish.

Legs yellow, femora somewhat thickened, the hind femora with two or three partial rows of conspicuous bristles on the upper side of the apical third.

Wing subhyaline with a dark shadow on the fork on the origin of the second vein, narrow dark margins on the cross veins and an infuscation of the tip beginning at the hind cross vein. The third vein ends exactly in the tip of the wing, the costa continuing very slightly beyond it, the fourth vein bends rather strikingly backward near the margin of the wing and becomes almost evanescent, its last section is more than double the preceding, the distance between the cross veins being about three-fourths of the length of the hind one.

Length, in the normal curved position. 5.2 mm.

Described from two females bred from ruteline beetles of the genus *Adoretus* at Taihoku, Formosa, by D. T. Fullaway.

Type.—Female, Cat. No. 40984, U.S.N.M.

Genus ADAPSILIA Waga.

Adapsilia WAGA, Ann. Soc. Ent. Fr., vol. 11, 1842, p. 280.

ADAPSILIA FLAVISETA, new species

In Hendel's key to the genus² the species would go in the first division, with the scutellum hairy on the disk, but readily separates from the two species included there by Hendel. It differs from both in having the wing infuscated throughout except the second basal and anal cells and the basal portion of the discal; the color is deepest between the second and third veins and a little behind the third. The second vein has an appendage as in *magnicornis*, which, however, has a transverse infuscated band on the wing.

It is more closely related to *trinotata* De Meijere,³ which, however, is considerably paler in color, with the pleurae chiefly yellow and a different color pattern in the wing.

Female.—Head dark reddish brown, facial carina, inner part of facial ridges, epistoma, and a triangular spot below the eye shining black. Back of head opaque black except along the eye and a semi-

² Archiv für Naturgeschichte, vol. 79, 1913, p. 81.

³ Tijdsch. Entom., vol. 57, 1914, p. 182.

circular occipital spot reaching almost to the neck, which are dark yellow; front opaque, at the vertex 0.40 of head width, the parafrontal shining, narrow above, widening at the antennae. Parafacial also shining, as wide as the third antennal joint. Antennae considerably elongated, dark brown, the basal joint a little lighter, second and third of about equal length; third rounded at apex; arista yellow. Palpi dark brown. Thorax black, not very shining, the scutellum and a very narrow postscutellum immediately below it yellow; the humeri are partly yellow and there is an irregular yellow spot around them extending part way to the center and back above the notopleural bristles to the suture.

Abdomen black, with a yellow band across the first segment prolonged backward at the edges, another including most of the dorsum of the fifth segment, and a large spot beyond the middle of the last or sixth segment. This segment is considerably smaller than the entire preceding part, irregularly constricted and bent downward. The first segment has a considerable cluster of long black hairs on each side at the base and on the sternites of the rest of the segments there is a cluster of such hairs on each side. The last segment has rather dense long hair all over the basal half. All of the hairs mentioned are black.

Legs black, all the femora slightly yellow below at apex, the femora stout and slightly grooved toward the apex for the reception of the tibia, the ridges bounding the groove being provided with rather stout slanting small spines. The front and middle tibiae are noticeably thickened from the middle, the hind ones from the first third, of their length; the middle tibiae have a distinct but not very stout curved spine at tip.

Wing as described, the costa extending to the fourth vein but becoming weaker after the third, which ends very slightly before the apex. Hind cross vein at right angles to the axis of the wing, last section of the fourth vein twice the preceding.

Length, 9 mm.

Described from five specimens, all of which appear to be females, bred at Shillong, India, from ruteline beetles by C. P. Clausen.

Type.—Female, Cat. No. 40983, U.S.N.M.

FAMILY TACHINIDAE

SIGELOTROXIS, new genus

Allied to *Phrynofrontina* Townsend (type *convexa* Townsend, equals *Sturmia discalis* Coquillett), with which it agrees in having wide, bowed parafacials and many other characters, but from which it differs in having the parafacials bristly over half way, no costal spine, no discals, minute ocellars, etc. It also resembles *Ptychomyia*

Brauer and Bergenstamm (type, *Tachina selecta* Meigen), but differs in having no discals, the ocellars on the triangle, not widely spaced opposite the front ocellus.

The principal characters are as follows: Antennal axis one and a half times the vibrissal, face curved, more receding below, parafacials rather wide; facial ridges prominent, bristly half way or more; both sexes with orbitals, only one frontal below origin of antennae; eyes bare; palpi normal, proboscis short; third antennal joint long and slender, arista bare, vibrissae at oral margin; third vein with two large setules at base, first bare; fourth vein broadly curved almost in a right angle, straight for a distance, then concave to costa, the first posterior cell closed in the margin only a little before the wing tip; costal section from first to second vein only a little shorter than from second to third; hind cross vein straight, semierect, barely beyond middle between small and bend.

Type of genus.—*Sigelotroxis parvus*, new species.

SIGELOTROXIS PARVUS, new species

Male.—Front 0.35 of head width; head with pale yellow pollen, frontal stripe brown, as wide above as both parafrontals; at least one proclinate orbital; palpi yellow apically, darker toward base; first two antennal joints reddish, third brown, very long and quite slender, fully five times the second; arista yellow basally, short, thickened about half way; cheek one-half the eye height. Thorax black, cinereous; scutellum broadly reddish. Chaetotaxy; acrostichal 3, 3; dorsocentral 3, 4; supraalar 3; intraalar 2; postalar 2; humeral 2; posthumeral 1; presutural 2 (inner small); notopleural 2; sternopleural 2, 1; scutellum with 3 lateral, a large pair of apicals and a smaller discal pair. Hypopleurals and post-scutellum as usual; calypters ivory white. Abdomen rather short, subshining black, a narrow band of pale pollen at base of third segment, fourth more than half pollinose. First abdominal segment without median marginals, second with a pair, third with row of six, fourth irregularly bristly except at base. Genital segments small, black. Legs black, pulvilli small, mid tibiae with one bristle on outer front side, hind tibia sub-ciliate. Wings hyaline.

Female.—Front 0.35 of head width; third antennal joint four times the second, probably two orbitals.

Length, 4.5 to 6 mm.

Described from three males and two females, reared from ruteline beetles at Foochow, China, in 1897 by C. R. Kellogg, received from the Hawaiian Sugar Planters' Experiment Station, to which two paratypes are returned.

Type.—Male, Cat. No. 40985, U.S.N.M.

Genus *PEXOMYIA* Brauer and Bergenstamm

Pexomyia BRAUER and BERGENSTAMM, Zweifl. Kais. Mus., pt. 5, 1891, p. 329; pt. 6, 1893, p. 114.—BRAUER, Verh. Zool.-Bot. Ges., vol. 102, 1893, p. 476; vol. 107, 1898, p. 543.—BAER, Die Tachinen, 1921, p. 78.—STEIN, Arch. Naturgesch., vol. 90, 1924, p. 99.

The genus originally included *Masicera rubrifrons* Perris and *Roeselia aberrans* Egger; the former was designated as type by Brauer in 1893, and Bezzi, in the Palaearctic Katalog, makes the latter a synonym.

Two males of *rubrifrons* in the United States National Museum, determined by Professor Bezzi, differ from *Centeter* in having bare eyes and parafacials, the vibrissal axis somewhat longer, and the prominent facial ridges with only weak bristles less than half-way up. Discal bristles occur on the second and third segments, and a discal row is present on the fourth. The habits of *rubrifrons* seem to be unknown.

The three related genera attacking ruteline beetles may be separated by the following key.

KEY TO *CENTETER*, *SIGELOTROXIS*, AND *PEXOMYIA*

1. The upper part of parafacial with distinct hairs anteriorly; eyes hairy.
Centeter Aldrich.
- Upper part of parafacial entirely bare; eyes bare----- 2.
2. Facial ridges bristly to middle or above, discals absent on intermediate abdominal segments; scutellum with no small apical pair of bristles.
Sigelotroxis Aldrich.
- Facial ridges bristly only below middle; discals present or absent; a small pair of apical scutellars present between the large third lateral pair.
Pexomyia Brauer and Bergenstamm.

PEXOMYIA *GENALIS*, new species

Female.—Front at vertex 0.41 of head width, parafrontal slightly wider than median stripe, which is dark red and continues on each side of ocellar triangle to inner vertical; frontals eight, extending to tip of second antennal joint, upper two reclinate but not large; two pairs of orbitals; parafacial wide; cheek equal to one-half the eye height. Pollen of head decidedly yellow above, grayish-yellow on parafacial, in front view the color changing suddenly below the lowest frontal.

Antennae reddish yellow nearly to middle of third antennal joint, the remainder blackish; the third joint four times the second. Arista thickened and yellow almost one-half way; basal joints short; vibrissae at oral margin with six or seven small decreasing bristles

above on facial ridges, which are decidedly prominent and sharp; ocellars proclinate and divaricate, outer verticals minute. Palpi yellow, of ordinary size; proboscis small. Cheek and back of head with only black hairs. Thorax with yellowish pollen, black in ground color, but with a reddish tinge on the apical part of scutellum. Mesonotum with a pair of blackish stripes and a distinct triangular black spot in front of inner presutural; also an elongated spot behind the suture. Chaetotaxy: Acrostichal 3, 3; dorsocentral 2, 4; humeral 3; posthumeral 2; presutural 2 (inner two-thirds as long as outer); notopleural 2; supraalar 3; intralar 3; postalar 2; sternopleural 2, 1; scutellum with three lateral, one discal, and a smallish divergent apical pair; postscutellum well developed; posterior calypter yellowish white.

Abdomen with yellowish-gray pollen on last three segments, more dense on the fourth, on the two preceding becoming thinner posteriorly so as to show a black but not very shining ground color. Second segment with a pair of median marginals; third segment with or without distinct pair of discals and a marginal row of eight; fourth segment with a discal row of six, and a few apical.

Legs black; middle tibia with one bristle on outer front side, hind with a sparse row rather uniform, except one larger below middle.

Wing subhyaline, rather rounded in outline, bend of fourth vein with gradual curve, the first posterior cell open, or barely closed just before tip. Hind cross vein rather straight and erect, somewhat nearer to bend than to small cross vein; first vein bare, third with two or three bristles at base. Last section of fifth vein hardly one-third the preceding; costal segment beyond tip of second vein considerably more than half as long as the one before it.

Male.—Head somewhat shriveled; third antennal joint longer and wider than in female, black almost to base; it as wide as the parafacial; orbital bristles present as in the female. Genitalia quite small, black, the inner forceps distinctly separated, short, rather broad at tip; outer forceps with broad black base attached to segment, the free part abruptly tapering and slender, black with slightly rounded tips.

Length, 4-6 mm.

Described from four females and one male, received from Dr. J. L. King; they were reared from *Popillia japonica* Newman at Riverton, N. J., from material obtained in Japan; emerged July 24, 1925.

Type.—Female, Cat. No. 41452, U.S.N.M.

Genus **CENTETER** Aldrich

Centeter ALDRICH, Proc. U. S. Nat. Mus., vol. 63, art. 6, 1923, p. 3.

CENTETER CINEREA Aldrich

Centeter cinerea ALDRICH, Proc. U. S. Nat. Mus., vol. 63, art. 6, 1923, p. 4.—CLAUSEN and KING, Journ. Econ. Ent., vol. 17, 1924, p. 77.—SMITH, Journ. Econ. Ent., vol. 17, 1924, p. 110.—KING and HALLOCK, Journ. Econ. Ent., vol. 18, 1925, p. 351.—SMITH and HADLEY, U. S. Dept. Agr., Circular No. 363, 1926, p. 37.—WEISS, Circular No. 103, N. J. Bur. of Statistics and Inspection, 1926, p. 11.—CLAUSEN, KING, and TERANISHI, U. S. Dept. Agr., Bull. No. 1429, 1927, p. 4, figs. and col. plate.—KING, ALLEN, and HALLOCK, Journ. Econ. Ent., vol. 20, 1927, p. 366.

This species, type of the genus, has been introduced into the United States from Japan as a parasite of the beetle *Popillia japonica* Newm., and is now established here.

The receipt of better preserved material than the types shows that the eyes are hairy, and the generic description should be corrected accordingly.

KEY TO SPECIES OF **CENTETER**

Abdominal segments 1 to 4 broadly shining black on nearly the apical half; tibiae and femora black.....**cinerea** Aldrich.
Whole abdomen covered with brownish-gray pollen, slightly tessellated; tibiae and tips of femora reddish.....**unicolor**, new species.

CENTETER UNICOLOR, new species

Female.—With all the generic characters of *cinerea*, differing as noted in the key. The arista is yellow on basal half; there are no proclinate orbitals, but outside the frontal row there are sometimes one or two small mesially inclined bristles. Three lateral scutellar bristles are present, but the small apical pair of *cinerea* is absent; hence the third lateral pair might be described as a large apical pair. Eyes distinctly hairy. The front is very wide, being 0.45 of the head width at vertex (as compared with 0.41 in the female of *cinerea*).

Described from four females from Suigen, Chosen (Korea); three are labeled "May 13, 1926, col. K. Sato;" the other "Parasite of *Anomala sieversi* and *Phyllopertha* sp." The abdomen of one specimen has been dissected away to show several large, white eggs, of the same type as in *cinerea*.

Type.—Female, Cat. No. 41451, U.S.N.M.

In conclusion it might be well to add that *Sigelotroxis parvus* differs from both species of *Centeter* in having bare eyes, the front much less prominent, the parafacial bare above near the facial ridge as well as elsewhere, and the eye considerably larger.

MONIEZIA, A GENUS OF CESTODE WORMS AND THE PROPOSED REDUCTION OF ITS SPECIES TO THREE

By E. LEONARD TAYLOR

Of the Veterinary Laboratory of the British Ministry of Agriculture and Fisheries

The work on which this paper is based was done in the laboratory of the Zoological Division of the Bureau of Animal Industry, United States Department of Agriculture, at the suggestion of Dr. Maurice C. Hall. The material and facilities of the helminthological collection of the United States National Museum were put at the disposal of the writer for this work.

The question of the number of valid species in the genus *Moniezia* was taken up by G. Theiler (in 1924) at the Liverpool School of Tropical Medicine. She found a wide range of variation in the segments of a single strobila, and came to the conclusion that only four species could be allowed, namely, *M. expansa*, *M. trigonophora*, *M. benedeni*, and *M. alba*, and of these four she expresses a doubt as to the validity of the two species *M. trigonophora* and *M. alba*. Two other species, *M. rugosa* and *M. amphibia*, are placed as species inquirendae, pending a reexamination of the original material. As this genus is of considerable economic importance it seemed particularly desirable to check over the above work.

It is much easier to divide a group of individuals into a number of species according to their various dissimilarities than to show satisfactorily that a number of dissimilar individuals really belong to one and the same species, and that their variations are not of specific rank. And it is indeed impossible, from a mere morphological study, to prove beyond doubt that the variations occurring do not go beyond the limits of one species. Proof could only be found by studying the variations occurring in the progeny of one parent worm, but our complete ignorance of the life cycle of worms of the genus *Moniezia* unfortunately renders this impossible.

The method followed in collecting data for this paper has been the same as that used by G. Theiler; fresh worms have been taken from sheep and cattle at the abattoirs, and complete specimens stained and

mounted *in toto* and examined from head to terminal segment. It is no small task to examine a large cestode in this way, for the number of segments present in each worm examined varied between 1,136 and 2,118 in the *M. expansa* group, and 758 and 1,462 in the *M. planissima* group. Twenty complete worms, selected because they showed the most varied naked eye appearance, and as many more portions of worms were examined in this way.

It is proposed to mention a number of the characters used in definitions of the species of the genus *Moniezia*, and to show that extremes of size and shape are joined by a more or less regular series of intermediate modifications.

In examining the descriptions of members of this genus the writer has found only six definite specific characters, which may be stated as follows: The interproglottidal glands may be absent, as in *M. alba* (1). When present they may be of the linear type, as in *M. planissima* (2), or they may be of the saccular type, as in *M. expansa* (3), or, according to Sauter, both types may be present in one worm, as in *M. conjugens* (4). The testes instead of being in one band may be arranged in two triangular areas, as in *M. trigonophora* (5). The uterine folds usually pass only on the dorsal side of the longitudinal excretory vessels, but they may pass both dorsally and ventrally, as in *M. pallida* (6).

Apart from these six characters, specific identity appears to depend upon a number of more or less slight variations, among which the following may be mentioned as the more important:

1. Shape and direction of the suckers, and shape of head.
2. Color and translucency of the strobila.
3. Length of the worm and the number of segments present in the strobila.
4. Size of the largest segment.
5. Width of the head.
6. Length of the neck.
7. Distance from the head at which the first genital primordia appear.
8. Distance from the head at which the first testes may be seen.
9. Number of testes present in each segment.
10. Interproglottidal glands, their number to the segment in the *M. expansa* group, and their length in the *M. planissima* group; and whether distinct or only faintly visible.
11. Position of the genital pore.
12. Size of the eggs.

1. From the study of the writer's material and of descriptions and drawings of the various species, the differences in the shape of the head seem to be no more than could easily be explained by the plastic

nature of this structure; and the same remark applies to the relative position and direction of the suckers.

2. Variations in color are only slight, and appear to depend entirely upon the age of the worm and whether the segments have reached the large intestines; older worms are yellower and segments in the large intestine become stained by the ingesta.

The variation in the translucency of the strobila is not very great and seems to be of no value. Characters which depend upon such comparative terms as "a little more" or "a little less than some other species" are obviously of slight value for definition, and in several species the shape of head and suckers, and the color and translucency of the strobila are so described.

Characters which are a matter of numbers, and of linear measurement can be dealt with in a more convincing manner, and there are given below the two extremes of size or number of various structures by a series of all the intermediate measurements. If any of the characters are valuable, and if there are two or more species present, some evidence of their presence should be seen in a marked discontinuity in the chain or intermediate variations.

3. *The number of segments in the strobila.* The number of segments were counted in seventeen strobila of the *M. expansa* group and the two extreme variations found to be 1136 and 2118 segments for each strobila: the intermediate worms joined these two in the following way, the figures representing the number of segments present in each worm: 1136, 1158, 1233, 1385, 1392, 1443, 1463, 1490, 1511, 1565, 1579, 1581, 1886, 1918, 1944, 1969, and 2118. It will be noticed that the only considerable gap is between 1581 and 1886, the remainder of the series running evenly.

4. Measurements in width of the largest segment taken from nineteen specimens of the *M. expansa* group were found to vary between 2 mm. and 8 mm., the list of measurements arranged in order being as follows, the numbers representing millimeters: 2, 2.8, 3, 4, 4.5, 4.8, 5, 5, 5, 5.5, 6, 6, 6, 6.5, 7, 7, 7, 7.5, 8. In this series there is no marked discontinuity, but a regular increase in size, the majority of the worms being of a medium size.

5. Measurements in width of head taken from seventeen specimens of the *M. expansa* group showed a variation between 0.42 mm. and 0.75 mm., the whole series, given in millimeters, being as follows: 0.42, 0.45, 0.48, 0.495, 0.495, 0.495, 0.515, 0.525, 0.57, 0.57, 0.585, 0.60, 0.615, 0.63, 0.645, 0.675, 0.75. The variation in this series shows no marked discontinuity.

6. Measurements taken from seventeen specimens of the *M. expansa* group showed a variation in length of neck between 0.15 mm. and 1.875 mm., the series of measurements in millimeters being as follows:

0.15, 0.30, 0.30, 0.36, 0.375, 0.405, 0.45, 0.75, 0.8, 0.90, 1.05, 1.15, 1.2, 1.5, 1.575, 1.59, 1.875. For the most part this series shows a uniform increase in size, the three greatest gaps being from 0.45 to 0.75, 1.2 to 1.5, and 1.59 to 1.875.

7. The distance from the head at which the first genital primordia make their appearance. In eighteen specimens of the *M. expansa* group this point was found to vary between the 150th and the 424th segment, the whole series being as follows, the figures representing the number of the segment from the head: 150, 155, 160, 180, 290, 300, 300, 316, 320, 320, 340, 350, 390, 400, 400, 410, 415, 424. There is a discontinuity of the series between 180 and 290, the remainder being very even.

8. The distance from the head at which the first testes may be seen. Of seventeen specimens of the *M. expansa* group this was found to vary between the 390th and the 1018th segment, the complete series being as follows, the numbers representing the number of the segments from the head: 390, 495, 672, 690, 697, 700, 710, 712, 720, 750, 761, 767, 801, 852, 910, 937, 1018. The variation in this series showed no marked discontinuity.

9. The number of testes was counted in a few segments of twelve specimens of the *M. expansa* group, and the greatest variation in any one worm was found to be between the 198 and 260 testes per segment, and the greatest variation within the twelve was found to be between 109 and 296. The average number of testes of each segment in each of twelve specimens of the *M. expansa* group formed the following series, each number representing the average number of testes to the segment: 120, 124, 147, 200, 202, 211, 215, 229, 240, 247, 247, 284.

The size of the testes also showed considerable variation, the greatest variation observed in one individual worm being between 0.07 and 0.15 mm. in diameter, and in the group of twelve worms examined the greatest variation observed was between 0.035 and 0.15 mm. The average diameter in millimeters of the testes in sixteen specimens of the *M. expansa* group was as follows: 0.040, 0.050, 0.052, 0.055, 0.060, 0.065, 0.067, 0.067, 0.075, 0.075, 0.077, 0.085, 0.087, 0.110, 0.110, 0.115.

10. The number of interproglottidal glands per segment. Of 15 specimens of the *M. expansa* group in which counts were made, the average number of glands to the segment was found to vary between 0.5 and 64 glands to the segment. The complete series of counts were as follows, each number representing the average number of glands present to the segment: 0.5, 6, 8, 9, 10, 11, 14, 16, 20, 40, 45, 54, 58, 60, 64. The greatest variation observed in one individual was between no gland and 42 glands, and the greatest varia-

tion in the group of 15 worms was between no gland and 76 glands to the segment.

No attempt was made to count the glands in very young segments, where they were insufficiently formed to be easily recognizable. It was observed that in some worms the number of glands was smaller at the anterior end, increasing toward the terminal segment; while the reverse was true of other worms, and some presented a middle part of the strobila with fewer glands than were seen toward the two extremities. One worm showed only occasional glands in the first 1,600 segments, there being only 303 glands in 777 segments mature enough to show formed glands.

11. The position of the genital pore. According to the observations made, the position of the genital pore varies only with the state of the muscular contraction of a segment and with the overlap of the previous segment, which may cause it to appear anterior to the middle but never posterior. It seems to be a very poor specific character.

12. Unfortunately no measurements were made of the eggs before staining and mounting the material studied, so that it is impossible to treat with these measurements as with the others.

With reference to the *M. planissima* type, showing the interproglottidal glands arranged in the form of a band, it was possible to obtain only four whole worms and five portions; these were subjected to the same kind of examination as that described for the *M. expansa* group and gave parallel results, the specimens showing great variation between segments in the same worm, and a greater, but not very much greater, variation between segments from different worms.

It was not possible to find a constant relationship between any of the various characters dealt with above, and the gradual series of variations shown in the measurements and counts given would suggest very strongly that the characters on which the determination of some species of *Moniezia* depends are no more than individual variations and have no specific value.

Four species call for special mention. *M. trigonophora*, as mentioned above, is distinguished by the grouping of the testes into two triangular masses. This character seems to be a very variable one and of seventeen specimens of the *M. expansa* group examined, only three were found which did not possess some segments in which this was shown. Two worms clearly showed the grouping in every segment and twelve worms showed the two types, some segments with the triangular grouping, and some with the band of testes running across the segment. If the number of segments showing the triangular grouping are expressed as a percentage of all the segments

in which testes were plainly seen the series reads as follows, each number representing so many per cent: 0, 0, 0, 0.5, 2, 4, 5, 8, 10, 22, 39, 59, 60, 81, 82, 100, 100.

In this connection Stiles and Hassall's types of this species were examined, and many segments were found in which the triangular arrangement of testes is by no means distinct. As has been shown by G. Theiler, *M. planissima* may also show this arrangement of testes in some segments, and in this species I have found it to be present in as many as 215 of 335 segments showing recognizable testes. It is therefore concluded that the triangular grouping of the testes is not a good specific character.

Moniezia alba has been distinguished by the absence of the interproglottidal glands. As reported by Theiler, these glands are sometimes very indistinct, or even absent; and as shown in the writer's observation there may be actually more segments without these glands than with them. In this connection Perroncito's type material was examined. The differentiation of the stain is poor in these specimens, which may account for the fact that it was impossible to find definite interproglottidal glands, but in Stiles and Hassall's original *M. alba* material it was possible to find satisfactory assurance that glands of the linear type were present in some of the segments. Doctor Hassall has informed the writer that at the time of the writing of the joint paper by Stiles and Hassall some doubt was entertained as to the validity of this species. It therefore seems most probable that the absence of interproglottidal glands is not a good specific character.

Moniezia conjugens has been described by Sauter as showing both types of interproglottidal glands in the same worm. The writer has not found any specimens of this kind, but has seen in *M. planissima* small portions of gland separated from the main strip and having the appearance of the saccular type when examined under a low magnification. However, when greatly magnified these glands are seen to be of the linear type as there is no evidence of any grouping of the gland cells round blind sacs. It is possible that Sauter overlooked this point but it seems preferable to leave his species, pending a reexamination of the original material, as a species inquirenda.

Moniezia pallida from the horse has recently been described by Monnig who kindly sent some of his type material to the Bureau of Animal Industry section of the United States National Museum Collection. The distinctive feature of this species is that the folds of the uterus pass ventrally, as well as dorsally, beyond the longitudinal excretory vessels. The writer sectioned several segments of this material and in each place found this disposition of the uterus to exist. He also sectioned six segments of *M. expansa* and four of *M. planissima*, each segment from a different worm, and found in

every section that the folds of the uterus passed only dorsally to the longitudinal excretory vessels, occasionally sending a short fold back from the lateral fields ventral to the vessels, but the folds never passing into the lateral fields by this way. It therefore seems probable that *M. pallida* is a valid species.

SUMMARY AND CONCLUSIONS

1. A number of complete specimens of *Moniezia* of the two groups *M. expansa* and *M. planissima* have been stained and examined *in toto* and a remarkable variation found to occur between the different segments in one worm. Although the range of variation is more marked when different worms are compared, it has been shown that extremes of size and shape and of the number of various parts are linked by a series of intermediates which shows no marked discontinuity. It therefore must be concluded that these characters are of no specific value.

The range of variation in the material examined does not completely cover the extremes which have been recorded in the description of the various species, but it is highly probable that the examination of more material would extend it to include these also.

2. Type material of *M. alba* and *M. trigonophora* has been re-examined and it is proposed to place these two species in synonymy.

3. The validity of the species *M. conjugens* is questioned, as specimens of *M. planissima* which at first appeared to possess both the linear and the saccular type of interproglottidal gland were shown on closer examination to have only the linear type.

4. Type material of *M. pallida* has been re-examined and Monnig's observations on the passage of the uterine folds ventral as well as dorsal to the longitudinal excretory vessels have been verified.

5. This work has verified the work done by G. Theiler, and it is proposed to synonymise the specific names as follows:

(a) *Moniezia expansa* (Rudolphi, 1810) Blanchard, 1891.

Synonyms:

M. oblongiceps Stiles and Hassall, 1893.

M. trigonophora Stiles and Hassall in Stiles, 1892.

M. minima Marotel, 1912.

M. nullicollis (Moniez, 1891) Blanchard, 1891.

(b) *Moniezia benedeni* (Moniez, 1879), Blanchard, 1891.

Synonyms:

M. planissima Stiles and Hassall, 1893.

M. translucida Jenkins, 1923.

M. alba (Perroncito, 1878) Blanchard, 1891.

M. triangularis Marotel, 1913.

M. latifrons Sauter, 1917.

M. crassicollis Sauter, 1917.

- M. parva* Sauter, 1917.
M. neumanni (Moniez, 1891) Blanchard, 1891.
M. pellucida Blei, 1920.
M. amphibia v. Linstow, 1901.
M. chappuisi Baer, 1923.
6. Three species are validated:
M. expansa (Rudolphi, 1810) Blanchard, 1891.
M. benedeni (Moniez, 1874) Blanchard, 1891.
M. pallida Monnig, 1926.
7. Two species remain as species inquirendae:
M. rugosa (Diesing, 1850) Luehe, 1895.
M. conjugens Sauter, 1917.

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EXPLANATION OF PLATES

PLATE 1

- FIGS. 1, 2, 3, 4. Examples of variation in head and neck of *Moniezia expansa*.
(All four are of the same magnification.)
- 5, 6. Two parts of one individual *Moniezia expansa* showing different arrangements of testes.

PLATE 2

- FIGS. 7, 8, 9. Three parts of one individual *Moniezia expansa* showing varying arrangements of testes and scarcity of interproglottidal glands. Only two glands are present in all the segments shown in Figures 8 and 9, and in Figure 7 there are no glands at all.
10. One part of one individual *Moniezia expansa* showing a variation in the number of interproglottidal glands present in different parts of the strobila.

PLATE 3

- FIGS. 11, 14. Two parts of one individual *Moniezia expansa* showing a variation in the number of interproglottidal glands present in different parts of the strobila.
- 12, 15. Two parts of one individual *Moniezia expansa* showing a considerable variation in the number of interproglottidal glands in the two different parts of the strobila.
13. Part of one individual specimen of *Moniezia planissima* showing various arrangements of testes. In Figure 24, the linear type of interproglottidal gland is seen broken into various lengths, the shortest of which might be mistaken for the saccular type of gland.

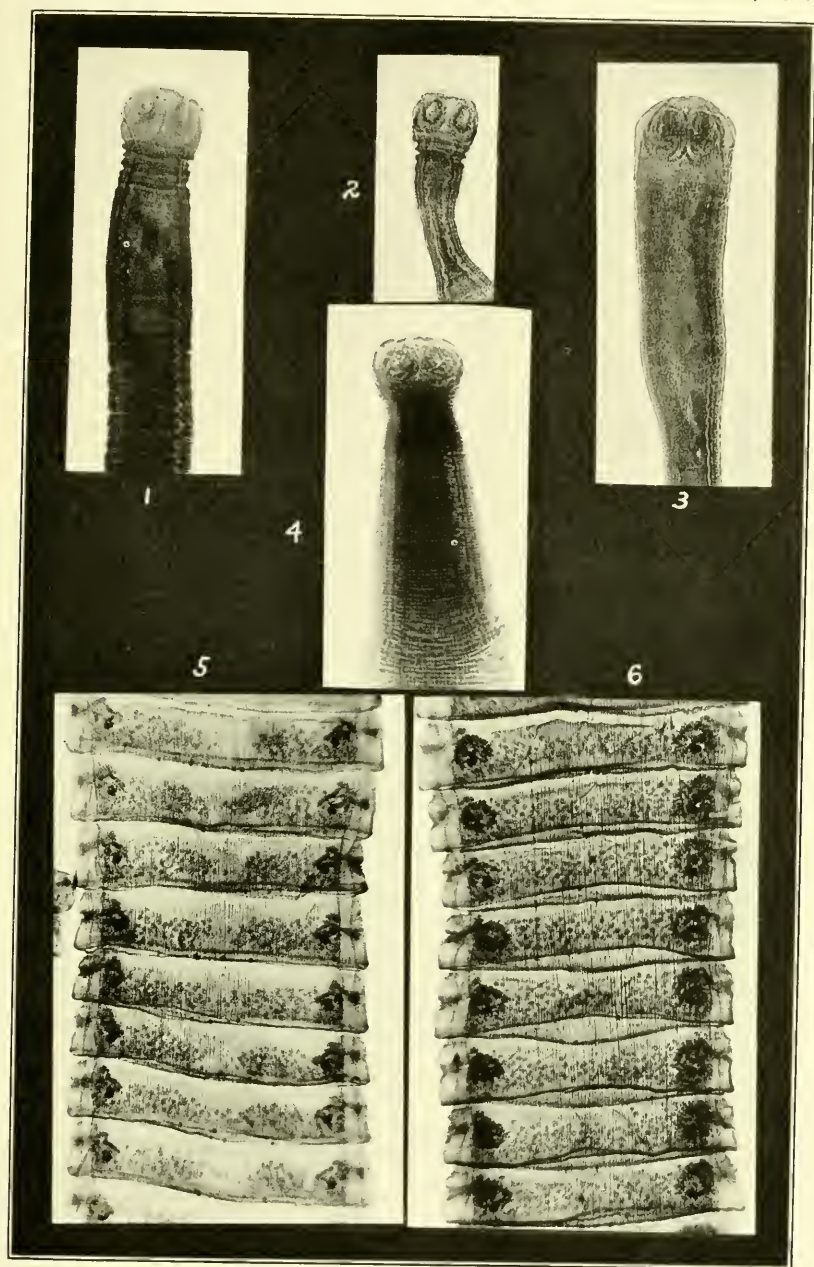
PLATE 4

- FIGS. 16, 17, 18. Three parts of one individual *Moniezia expansa* showing variation in the arrangement of the testes.
19. Parts of one individual specimen of *Moniezia expansa* showing large numbers of interproglottidal glands. The individual shown in Figures 10 and 11 is intermediate between these and the worms shown in Figures 7, 8, 9, 15, 16, and 17.

PLATE 5

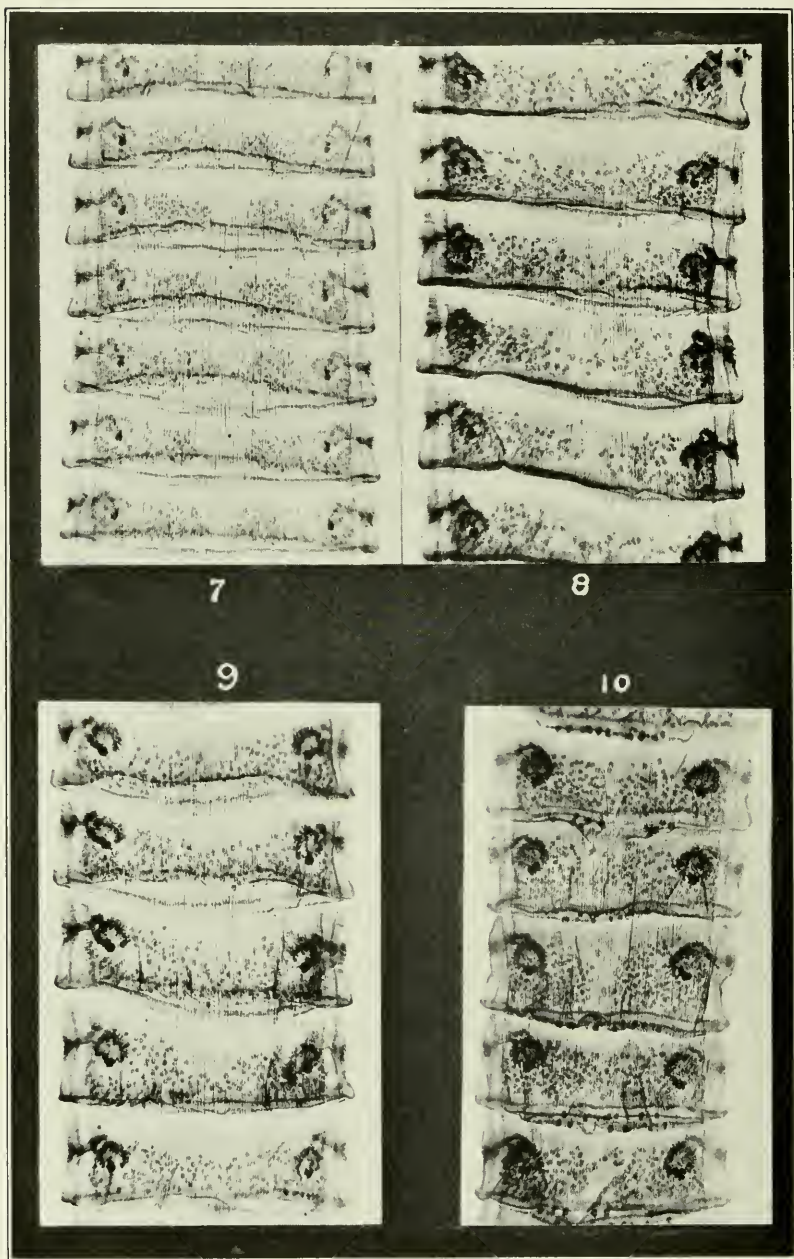
- FIGS. 20, 21. Parts of two individual specimens of *Moniezia planissima* showing the various arrangements of testes. In Figure 24 the linear type of interproglottidal gland is seen broken into various lengths, the shortest of which might be mistaken for the saccular type of gland.
- 22, 24. Two parts of one individual *Moniezia expansa* showing variation in the shape of the segments and a very crowded arrangement of interproglottidal glands.
23. Parts of one individual specimen of *Moniezia expansa* showing large numbers of interproglottidal glands. The individual shown in Figures 10 and 11 is intermediate between these and the worms shown in Figures 7, 8, 9, 15, 16, and 17.

All the figures of portions of strobila are of the same magnification



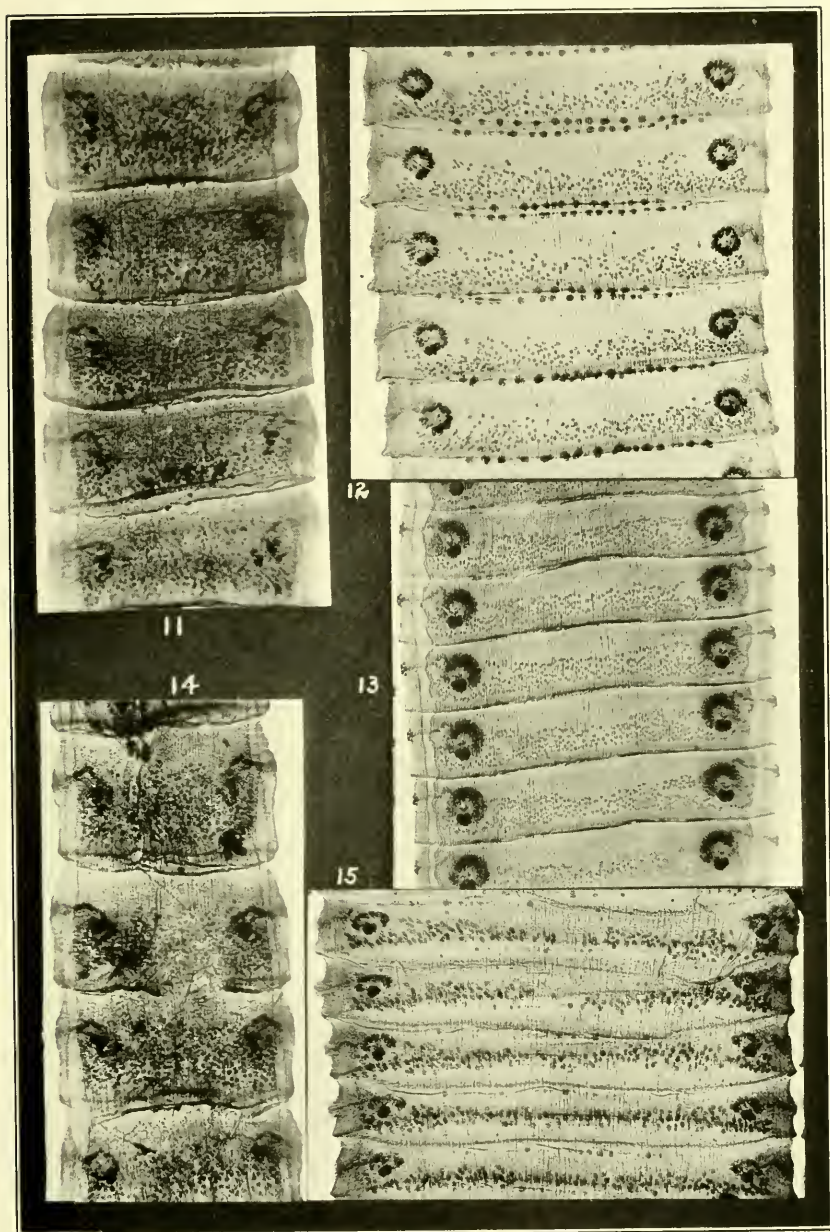
VARIATIONS IN *MONIEZIA EXPANSA*

FOR EXPLANATION OF PLATE SEE PAGE 9



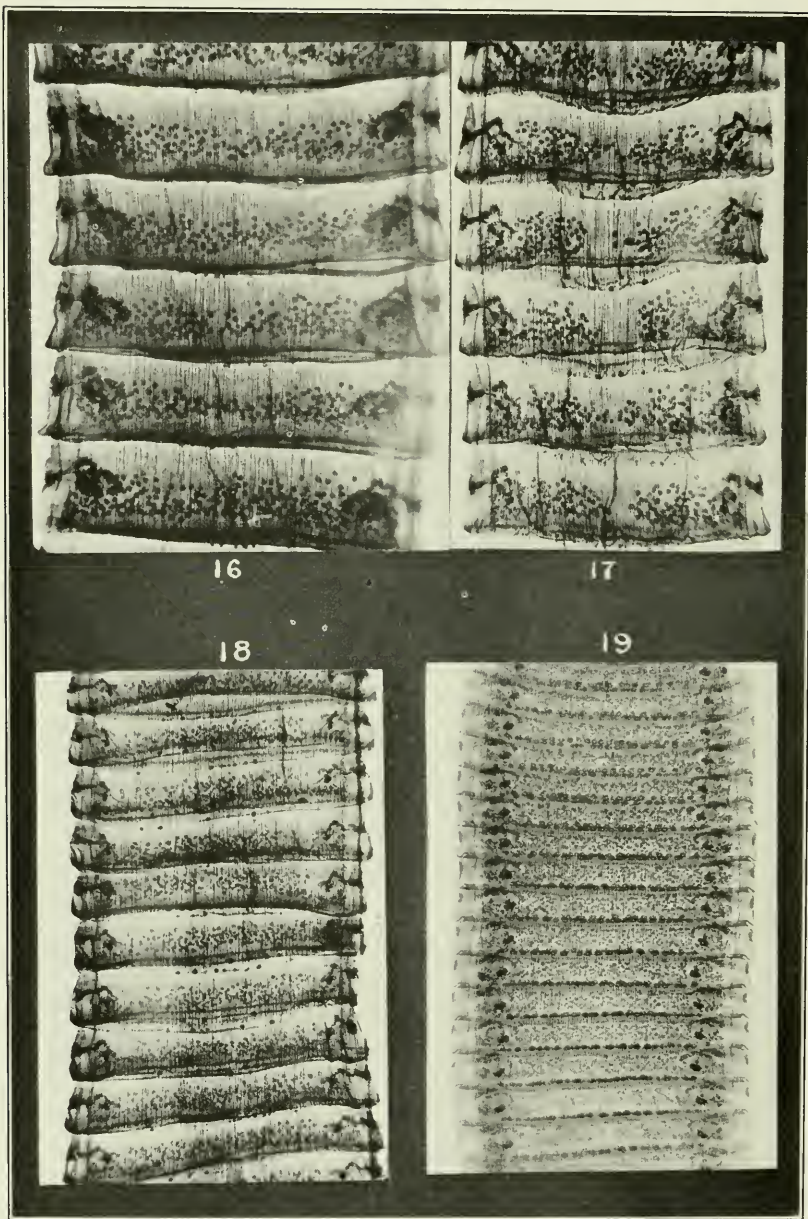
VARIATIONS IN *MONIEZIA EXPANSA*

FOR EXPLANATION OF PLATE SEE PAGE 9



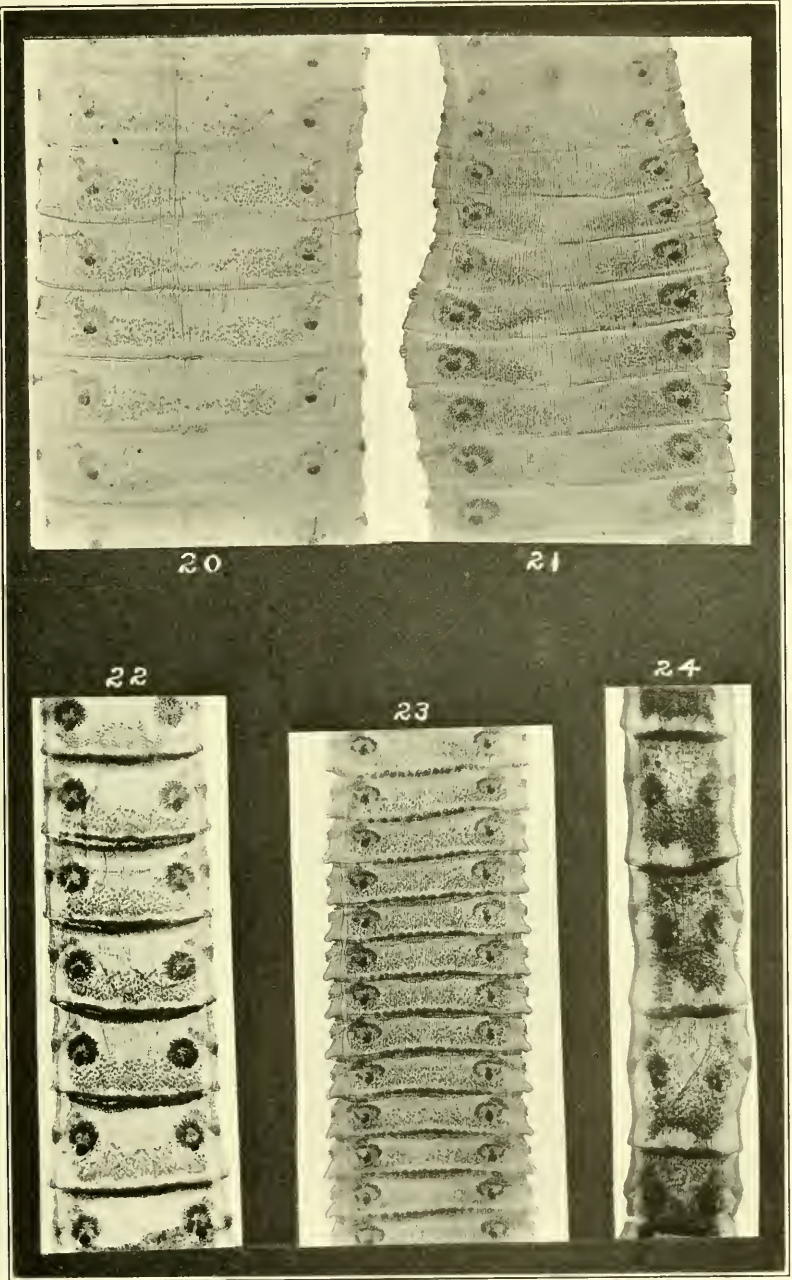
VARIATIONS IN *MONIEZIA EXPANSA* AND *M. PLANISSIMA*

FOR EXPLANATION OF PLATE SEE PAGE 9



VARIATIONS IN *MONIEZIA EXPANSA*

FOR EXPLANATION OF PLATE SEE PAGE 9



VARIATIONS IN *MONIEZIA EXPANSA* AND *M. PLANISSIMA*

FOR EXPLANATION OF PLATE SEE PAGE 9

TROPICAL AMERICAN DIPTERA OR TWO-WINGED FLIES OF THE FAMILY DOLICHOPODIDAE FROM CENTRAL AND SOUTH AMERICA

By M. C. VAN DUZEE

Of Buffalo, N. Y.

The following paper is a report on three collections of Dolichopodidae: one taken by J. M. Aldrich in Guatemala, during May and June, 1926; one by C. T. Greene in the Panama Canal Zone, during March and April, 1926; and the third by Nathan Banks in the Panama Canal Zone, during June, July, and August, 1924. There were a few specimens taken by others among the material studied.

These collections contain 77 species, of which 61 are described as new; there are two new genera. From the large proportion of undescribed forms among them it would seem that there is much work to do before we have even a good general knowledge of the species inhabiting this interesting region.

In using the measurements of tarsal joints there must always be an allowance made for individual variation and also the personal equation, as no two persons seem to measure the joints with just the same result when the measurements are made from pinned specimens, but I think they will give the proportional length of the joints much more accurately than any other method, unless the feet are mounted on a slide.

I wish to express my sincere thanks to Dr. J. M. Aldrich for the privilege of studying the material from the United States National Museum, and to Mr. Nathan Banks for sending me that from the Museum of Comparative Zoölogy.

Genus *PSILOPUS* Meigen

Psilopus MEIGEN, Systematische Beschreibung, vol. 4, 1824, p. 35.—LOEW, Smiths. Misc. Colls., No. 171, 1864, p. 229.—ALDRICH, Trans. Amer. Ent. Soc., vol. 30, September, 1904, pp. 279-286.—VAN DUZEE, Ent. News, vol. 26, January, 1915, pp. 17-26.

PSILOPUS CLAVIPES Aldrich

Psilopus clavipes ALDRICH, *Biologia*, Diptera, vol. 1, 1901, p. 363.

One male was taken by C. M. Rouillard, La Providencia, Siquinala, Guatemala. J. M. Aldrich took many in April, 1926, at the same place, and one at Antigua, Guatemala, May 3, 1926. Nathan Banks took one at Bella Vista, Panama, August 7, 1924.

PSILOPUS PRAESTANS Aldrich

Psilopus praestans ALDRICH, *Biologia*, Diptera, vol. 1, 1901, p. 354.

Four males and one female were taken by J. M. Aldrich, in Guatemala, at La Providencia, Siquinala, April 15 and 16, 1926, and at Quirigua, May 7, 1926.

PSILOPUS CILIIPES Aldrich

Psilopus ciliipes ALDRICH, *Biologia*, Diptera, vol. 1, 1901, p. 355.

Nathan Banks took two at Barro Colorado Island, Panama Canal Zone, June 20 and July 22, 1924; one at Las Sabanas, Panama, July 7; and one at Bella Vista, Panama Canal Zone, August 7, 1924.

PSILOPUS COMATUS Loew

Psilopus comatus LOEW, *Neue Beitr.*, pt. 8, 1861, p. 89; *Mon. North Amer. Dipt.*, pt. 2, p. 262, 1864.

One male taken by Nathan Banks at Fort Davis, Panama Canal Zone, August 7, 1924.

PSILOPUS FORCIPATUS Aldrich

Psilopus forcipatus ALDRICH, *Biologia*, Diptera, vol. 1, 1901, p. 362.

C. T. Greene took one male April 7, 1926, at Ancon, Panama Canal Zone. Nathan Banks took seven males and females, August 8, 1924, at Bella Vista, Panama.

PSILOPUS CHRYSOPRASIUS Walker

Psilopus chrysoprasius WALKER, *List*, pt. 3, 1849, p. 646.—LOEW, *Mon. North Amer. Dipt.*, pt. 2, 1864, p. 265.

One pair, taken by C. T. Greene, March 22 and 28, 1926, at Ancon, Panama Canal Zone.

PSILOPUS PURPUREUS Aldrich

Psilopus purpureus ALDRICH, *Biologia*, Dipt., vol. 1, 1901, p. 362.

Seven males and females were taken by C. T. Greene, March 22 to April 22, 1926, at Ancon, Panama Canal Zone; one male taken by Nathan Banks, August 8, 1924, at Bella Vista.

PSILOPUS DIGITATUS Van Duzee

Psilopus digitatus VAN DUZEE, *Canad. Ent.*, vol. 46, 1914, p. 391.

One male, taken by J. M. Aldrich, April 10, 1926, at Guatemala City, Guatemala; and one male taken by C. M. Rouillard, at La Providencia, Siquinala, Guatemala.

PSILOPUS BILOBUS, new species

Male.—Length 4 mm. Front green; face more blue-green, when viewed from above wholly covered with silvery white pollen, rather narrow, its suture at the middle. Palpi brown, proboscis yellow. Antennae small, bristles on second joint scarcely as long as antenna; third joint rounded; arista dorsal, about as long as the width of the head.

Thorax and abdomen green, shining; pleurae with silvery white pollen, bristles of thorax and abdomen quite short; hairs of the abdomen black, but appearing pale in certain lights; no long pale hairs on the venter. Hypopygium (fig. 1) small, brown, with two long, brown filaments, fringed with long pale hairs; these filaments reach the middle of the venter of third segment from the hypopygium.

All coxae, femora, tibiae, and basitarsi yellow; tarsi from the tip of first joint and a very narrow streak on outer surface of middle coxae black; fore coxae with pale hairs near the base, short black hair on inner surface, outer side nearly bare, with a row of three black bristles on apical half; all femora nearly bare below; fore tibiae without bristle, middle ones with two pair of rather small bristles on upper surface; posterior tibiae with one small bristle near the base on outer side. Fore tarsi (fig. 2) with the second joint narrowed at apical third so as to form a large lobe below at base and a small one at tip; third joint not much longer than wide; apical joint of hind tarsi a very little flattened and widened, but only enough to appear rather stout; joints of fore tarsi as 72-21-7-22-8; those of middle ones as 77-29-21-9-6; joints of posterior tarsi as 48-22-14-11-9. Calypters yellow with a narrow black margin and black cilia, which appear pale in certain lights.

Wings (fig. 3) wide and rather short, grayish; costa without cilia; cross vein perpendicular to fourth vein; fourth vein from cross vein to fork 42, from fork to wing margin 22, cross vein 22, last section of fifth vein fifteen-fiftieths of a millimeter long.

Described from one male, taken by Nathan Banks, July 5, 1924, at Fort Davis, Panama Canal Zone.

Type.—In the Museum of Comparative Zoölogy.

PSILOPUS LONGIPES, new species

Male.—Length 4 mm.; of wing about the same. Face and front green with blue reflections, face covered with white pollen when

viewed from above, its suture below the middle; palpi and proboscis yellow. First two antennal joints yellow, third dark brown, about as long as wide; longest bristles on second joint about half as long as the antenna; arista dorsal, scarcely as long as width of head.

Thorax and abdomen green; dorsum of thorax with blue reflections, its bristles black and rather short; scutellum with one pair of bristles; pleuræ covered with silvery white pollen, the posterior edge mostly yellow; venter yellow, except on apical segments. Hypopygium brown, not very large, with a pair of long slender appendages, which are about as long as third joint of middle tarsi and fringed with long hairs.

All coxæ yellow, middle ones largely brown on outer surface; fore coxæ with small white hairs and with yellow bristles at tip; posterior coxæ with one yellow bristle; all femora and tibiae wholly yellow, the former almost bare below, the latter almost without bristles, except a small one on middle pair; fore and middle tarsi long and slender, especially the first joint, yellowish at base, but mostly brown; hind tarsi black; middle basitarsus somewhat ciliated but the hairs very short, fifth joint slightly flattened; joints of fore tarsi as 145-32-20-17-7; of middle ones as 127-48-41-26-10; first four joints of posterior pair as 109-42-26-12. Calypters yellow with a narrow black edge and yellow cilia. Halteres yellow. Wings (fig. 4) grayish, long; costa ciliated with very delicate pale hairs; first vein reaches about one third the length of the wing; last section of fifth vein 18, cross vein forty-seven fiftieths of a millimeter long.

Female.—Very much like the male; suture of the face near the middle. Tarsi nearly as slender as in the male, but shorter.

Described from one pair taken by Nathan Banks, at Bella Vista, Panama.

Type.—Male, August 8; *allotype*, female, July 6, 1924. Both in the Museum of Comparative Zoölogy.

PSILOPUS SEMICOMATUS, new species

Male.—Length 4 mm.; of wing the same. Face narrowed below, green, the suture near apical third, lower part with coarse gray pollen on the sides and along the front edge. Front blue with violet reflections and long pale hair; palpi and proboscis black. Antennæ black, bristles on second joint one and a half times as long as the antenna; third joint a little pointed at tip; arista nearly apical, about as long as the abdomen.

Thorax green with blue and violet reflections; scutellum blue with two pairs of large bristles; bristles of thorax and abdomen large. Abdomen green with blue reflections, last two segments more coppery. Hypopygium (fig. 5) brown with a long, nearly cylindrical peduncle, the lamellæ large, somewhat leaf-like; yellow; there are two bristles,

composed of several long hairs at tip of abdomen, these are as long as the last three segments taken together.

Coxae and femora green, fore coxae with white hair and two black bristles; all femora with long pale hairs below, extreme tips of fore and middle femora brown; all tibiae and fore and middle tarsi yellow, tips of fore and middle tarsi, the whole of posterior tarsi and extreme tips of hind tibiae black. Fore tibiae with four bristles of rapidly increasing length, the last about three-fourths as long as the tibia; middle tibiae with two long bristles above and three very short ones below. First joint of fore tarsi (fig. 6) with eight very long bristles of increasing length; second and third joints each with one long slender bristle near the tip; middle and hind tarsi slender, plain; joints of fore tarsi as 89-35-30-18-6; those of middle ones as 107-36-28-12-8; joints of posterior pair as 87-29-21-14-7. Calypters and their cilia black; knobs of halteres yellow.

Wings grayish; costa with only very short hair; first vein reaching to the middle of the wing; cross vein oblique; fork of fourth vein extending backward, the angle being less than a right angle; cross vein 50, last section of fifth vein 21, fourth vein from the cross vein to the fork 37 and from the fork to wing margin twenty-fiftieths of a millimeter long.

Female.—Five females taken at the same place and day as one of the males described above, agree with the males in the form of the face, antennae, venation of wings and color of the coxae, femora and tibiae; the fore and middle tarsi are brownish toward their tips; the hairs on second antennal joint are about as long as the antenna; fore femora with long bristly hairs like those of the male, longer than the second joint of middle tarsi; fore and middle tibiae each with three long bristles; fore basitarsus without cilia or long hair, but with a few minute spines; joints of fore tarsi as 74-22-16-12-7; those of middle ones as 74-28-17-9-6; joints of posterior pair as 69-26-16-11-6.

Described from two males and six females, taken by J. M. Aldrich, April 14 and 16, 1926, at La Providencia, Siquinala, Guatemala; and one male taken at the Tropical Research Station, New York Zoological Society, British Guiana, the last returned to the American Museum, New York.

Type.—Male, Cat. No. 41028, U.S.N.M.

This form is very much like *comatus* Loew; the form of the hypopygium, face and fore tarsi, and the venation of the wings are the same, but this has two stouter and shorter bristles on middle tibiae and no cilia at all on middle tarsi; in *comatus* there are three bristles on middle tibiae of rapidly increasing length, the last one very long and slender, and the middle basitarsi have long conspicu-

ous cilia on the whole of their upper surface, which extend along the following joints although much shorter.

PSILOPUS PLANIPES, new species

Male.—Length 4 mm. Face green, a little narrowed below; when seen from above it is nearly covered with silvery white pollen. Front shining green. Palpi very small, black; proboscis yellow. First two antennal joints black (third missing in type); longest bristle on second joint but little longer than diameter of joint.

Thorax and abdomen shining green with bronze reflections; the first three incisures at base of abdomen narrowly yellowish; bristles of thorax and abdomen short; scutellum with one pair of bristles; posterior edge of pleurae narrowly yellow. Hypopygium (fig. 7) small, brown, with two narrow brown appendages projecting downward and fringed with long hairs.

All coxae, femora and tibiae wholly yellow, tarsi yellow with last joint black; fore coxae nearly bare, with black bristles at tip; bristles on outer surface of posterior coxae yellow; anterior and posterior tarsi plain, without bristles or long hair; joints of fore tarsi as 56-21-14-10-6; first joint of middle ones as 87; joints of posterior pair as 62-28-12-9-5. Calypters yellow with brown tips and yellow cilia; halteres yellow.

Wings grayish; costa with rather conspicuous, delicate, recumbent hair; venation as in *bilobata*, new species; fourth vein from the cross vein to the fork 44, from the fork to the wing margin 22, last section of fifth vein 18 and the cross vein twenty-four fiftieths of a millimeter long.

Described from one male, taken by Nathan Banks, July 8, 1924, on Mount Hope, Panama Canal Zone.

Type.—In the Museum of Comparative Zoölogy.

PSILOPUS MENSOR, new species

Male.—Length 3.5 mm.; of wing 4 mm. Front and face purple, the latter with a little brownish pollen, that around the edge more white, suture near apical third, curved so as to make the lower portion nearly round. Palpi black, proboscis brown. Antennae black, third joint small, brown, bristles of second joint a little longer than the antenna; arista dorsal, scarcely as long as the width of the head.

Dorsum of thorax and scutellum purple, pleurae partly yellowish, bristles of thorax moderately long. Abdomen purple with the incisures narrowly blue-green, its bristles slender and rather short. Hypopygium brown with brown appendages, which are slender and about as long as the hypopygium.

Fore coxae, all tibiae, fore and middle femora, first three joints of fore tarsi and first joint of middle tarsi yellowish brown; middle and hind coxae, hind femora and tarsi mostly black or metallic; all femora with long white hair below; fore coxae with quite long white hair on inner anterior surface and two black bristles on outer anterior edge; fore tibiae with four rather small bristles above; middle tibiae with a row of about fourteen bristles of about equal length; fore tarsi (fig. 8) with the fifth joint nearly round, first joint with three bristles; middle tarsi (fig. 9) with a row of hairs having their tips slightly enlarged, extending the whole length of the first two joints, also four stout bristles on first joint; hind tarsi (fig. 10) with the last three joints flattened and widened, the last two (fig. 11) arched and provided with bristles below, seemingly to form a grasping organ; joints of fore tarsi 57-19-13-7-4; middle ones as 114-20-15-6-5; joints of posterior pair as 74-15-6-10-11, width of fifth joint as 8. Halteres and cilia of the calypters black.

Wings grayish; venation about as in *longipennis*; fourth vein from the cross vein to the fork 53, from fork to wing margin 20, last section of fifth vein 13, and cross vein thirty-three fiftieths of a millimeter long; first vein reaching the middle of the wing.

Described from one male taken by Nathan Banks, July 6, 1924, at Bella Vista, Panama Canal Zone.

Type.—In the Museum of Comparative Zoölogy.

PSILOPUS BICOLORIPES, new species

Male.—Length 4 mm.; of wing 4.5 mm. Face green, wide above, narrow below, almost without pollen, its suture near apical third. Palpi and proboscis black with pale hair. Front mostly blue or violet. First two antennal joints black (third missing in type); longest bristle on second joint about twice as long as width of joint.

Dorsum of thorax green with violet reflections, dulled with a little brownish pollen; pleurae largely yellow or yellowish brown. Abdomen green, first segment and narrow incisures of following segments blue; bristles of thorax and abdomen moderately long. Hypopygium, small, brown, its lamellae (fig. 12) large, thin, whitish with a brown border (partly folded in the drawing), and having irregular projections and hairs on the edge.

All coxae, femora, and middle and hind tibiae and tarsi brownish, fore tibiae and tarsi yellow; fore coxae with long white hair; all femora with long white hair below; fore tibiae with six slender bristles of increasing length on anterior surface; middle tibiae with three bristles, the one near the middle and one near apical third nearly as long as the second joint of middle tarsi; posterior tibiae with long hair and a row of about seven slender bristles on anterior surface of basal half, which are twice as long as the diameter of the

tibia; fore and middle tarsi with snow-white hairs on lower surface of last two joints, those on middle tarsi very conspicuous; joints of fore tarsi as 84-23-17-10-7; those of middle ones as 107-27-20-10-6; joints of posterior tarsi as 71-24-17-10-8. Calypters and halteres brown, the former with black cilia.

Wings grayish; first vein reaching nearly to the middle of the wing; venation very much like that of *longipennis*, new species, except that the fork of fourth vein is at nearly right angles to fourth vein, not being bent backward.

Described from one male, taken by Nathan Banks, August 8, 1924, at Bella Vista, Panama Canal Zone.

Type.—In the Museum of Comparative Zoölogy.

PSILOPUS LONGIPENNIS, new species

Male.—Length 5.2 mm.; of wing 6 mm. Face dark green with a little brown pollen at lower edge, the suture a little above the middle. Front shining green with blue reflections, especially below. Palpi and proboscis black. Antennae black, short, bristles of second joint but little longer than its width, third joint rounded; arista nearly apical, as long as width of head.

Thorax blue-green; scutellum with two pair of bristles. Abdomen green with basal half of second, third, and fourth segments dull black, fifth and sixth segments mostly brown; bristles of thorax and abdomen moderately long. Hypopygium brown, lamellae (fig. 13) black with the base yellowish, they are enlarged at tip with a broad notch on one side and a few long hairs at tip.

Coxae and femora black, fore coxae and lower surface of all femora with long white hair; fore and middle tibiae dark yellow, posterior pair more brown; all tarsi brown or black; tibiae almost without bristles, posterior ones with conspicuously long hair; last joint of fore tarsi a very little widened; second, third and fourth joints of hind tarsi slightly enlarged, so as to appear thick; middle basitarsus (fig. 14) with little bristles on one edge, which are rather scattering and on the other edge a close-set row of blunt and slightly clavate hairs, which are shorter than the bristles on the other side; joints of fore tarsi as 108-30-26-14-11; of middle ones as 141-27-22-11-6; those of posterior pair as 100-21-21-15-10. Calypters brownish, their cilia black; knobs of halteres yellow.

Wings (fig. 15) grayish; long and rather narrow; costa with rather long recumbent hair; first vein reaching nearly to the middle of the wing; fourth vein from the cross vein to the fork 74, from fork to wing margin 28, cross vein 48, and last section of fifth vein twenty-three fiftieths of a millimeter long.

Described from a male taken by Nathan Banks, August 1, 1924, at Barro Colorado Island, Panama Canal Zone; he also took another,

which is probably the same species but is badly broken, at Ancon, Panama Canal Zone, August 6, 1924.

Type.—In the Museum of Comparative Zoölogy.

PSILOPUS CYLINDRICUS, new species

Male.—Length 3.5 mm.; of wing 2.6 mm. Face and front green with blue reflections, face covered with silvery white pollen when seen obliquely, its suture a little below the middle; front with a few yellow hairs on upper orbits, palpi small, black; proboscis yellow. Antennae black, third joint small, rounded, one bristle on second joint about as long as the antenna; arista dorsal, not as long as width of head.

Thorax and abdomen shining green, scutellum and first two abdominal segments mostly blue; thorax with a very little white pollen along the front; scutellum with two pairs of large bristles; bristles of thorax rather large, those of abdomen short, except on last two segments; venter green with a few short pale hairs. Hypopygium (fig. 16) small with rather long, black lamellae.

Fore coxae, all femora and tibiae yellow; fore coxae with short white hair and two black bristles; middle and hind coxae and tips of hind femora black; all femora with long pale hairs below, which are not as long as their width; fore tibiae with two small bristles below and two still smaller ones above; middle tibiae with several small bristles; hind tibiae a little brown at tip, with two small bristles on upper anterior edge, tarsi brown, plain; joints of fore tarsi as 50-24-20-10-9; those of middle ones as 67-21-16-9-6; joints of posterior pair as 54-23-15-11-9; calypters yellow with black tips and cilia; knobs of halteres yellow.

Wings grayish; costa with very short recumbent hairs; fork of fourth vein at nearly right angles to fourth vein, distance from fork to cross vein 38, from fork to wing margin 24, last section of fifth vein 18 and cross vein thirty-one fiftieths of a millimeter long; first vein reaching about two-fifths of the length of the wing.

Described from one male, taken by Nathan Banks in 1924 at Gamboa, Panama Canal Zone.

Type.—In the Museum of Comparative Zoölogy.

PSILOPUS ANGUSTATUS, new species

Male.—Length 6.7 mm.; of wing 6 mm. Face a little narrowed below, green with violet or blue reflections, lower part almost wholly blue, suture slightly above the middle. Palpi black, proboscis yellowish brown. Front violet with black hair on upper half, which is quite long next to the orbits. Antennae black, first joint brown below; second joint with only a few bristles, the longest being scarcely longer

than the diameter of the joint; third joint small, rounded; arista dorsal, scarcely as long as the width of the head.

Thorax green, posterior half of dorsum and the scutellum with blue reflections; scutellum with two pair of large bristles; bristles of thorax and abdomen short; first abdominal segment violet on posterior portion, the other segments green with blue reflections, except the fourth, which is green with bronze reflections, last segment mostly blue posteriorly; second segment with a black crossband, the following ones black at base, the black becoming wider on each succeeding segment. Hypopygium (fig. 17) black with brown appendages, the outer appendages with four bristles on inner edge and many fine hairs on outer edge.

Coxae and femora black; fore coxae with moderately long white hair and two black bristles; all femora with long pale hairs below; fore and middle tibiae dark yellow, posterior pair yellowish brown; fore tibiae with a few slender bristles on lower posterior edge, four of which are quite long; middle and hind tibiae with one small bristle near the base; tarsi black; middle basitarsi with short, clavate hairs below, which extend up the tibiae and are shorter than the hairs on upper surface; hind tarsi with last three joints slightly flattened and widened; joints of fore tarsi as 97-33-26-18-9; those of middle ones as 135-30-26-11-6; joints of posterior pair as 110-28-20-17-10. Calypters, their cilia and the halteres black.

Wings grayish, with the usual crossbands large, united along the costa as far as the third vein and also narrowly along the fourth vein, leaving a nearly square hyaline spot between third and fourth veins; the bands narrowly reach the hind margin of the wing at tip of fifth vein and also at tip of fourth vein, along the costa the brown reaches from the tip of first vein to tip of the fork of fourth vein and follows this fork to wing margin; from tip of first vein to base of wing and from the costa to third vein the wing is tinged with yellow; upper bend of fork of fourth vein with a stump vein, this fork bent backward so as to form a 50° angle with fourth vein; cross vein only slightly oblique, almost at right angles to fourth vein; last section of fifth vein 14, cross vein 44, fourth vein from cross vein to fork 75, from fork to wing margin twenty-six fiftieths of a millimeter long; first vein reaching about two-fifths of the length of the wing.

Female.—Length 4 mm. Agrees with the male in the color of the face, front, proboscis and palpi; in the form of antennae, its bristles and arista; and in the venation of wings and color of legs and feet, except that the tibiae are all yellow. The joints of fore tarsi are as 90-18-12-8-5; those of middle ones as 82-20-18-7-5; those of posterior pair as 62-25-15-9-6; middle basitarsi without clavate bristles, fore basitarsi with a few little bristles below.

Described from one pair, taken by J. M. Aldrich, May 7 and 8, 1926, at Quirigua, Guatemala.

Type.—Cat. No. 41029, U.S.N.M.

PSILOPUS SEMICILIATUS, new species

Male.—Length 5 mm.; of wing 5.5 mm. Face green above, lower part blue, the suture a little below the middle, pollen along the orbits quite thick. Palpi and proboscis black with black hair. Front shining blue. Antennae black, rather short, bristles of second joint numerous and more than twice as long as the antennae; third joint small; arista dorsal, as long as width of head; orbital cilia and hair on lower part of head long, white.

Thorax green, sides and posterior half of dorsum blue; scutellum with two pair of long slender bristles; bristles of thorax and abdomen long; three basal segments of abdomen blue, the apical segments green with bronze reflections. Hypopygium (fig. 18) black, its lamellae black with about six stout spines in a group on one edge.

Coxae and femora green; tibiae and tarsi black; fore coxae with white hair, which is longer than their diameter, and two slender black bristles; all femora with long white hair below; fore tibiae with a row of six black bristles on lower posterior edge, which are longer than the fourth joint of fore tarsi and become a little shorter apically; middle tibiae with five short, slender bristles on upper anterior and four on upper posterior edge of basal half, also one a little longer, stouter and nearly erect, near the tip on lower anterior edge; posterior tibiae with about nine slender bristles on anterior surface of basal two-thirds these are fully as long as those on fore tibiae; first joint of fore tarsi (fig. 19) with one erect bristle near the base below and about ten on apical half, which are not in a row; joints of fore tarsi as 106-13-15-16-8; those of middle ones as 155-30-25-15-11; joints of posterior pair as 105-23-20-15-9; the last four joints of hind tarsi a little swollen. Calypters, their cilia and the halteres black.

Wings grayish with the usual crossbands, the hyaline space between them reaching third vein, they do not reach the hind margin of the wing; the brown extends along the costa from just before the tip of first vein to tip of second vein; hairs on the costa quite long, but recumbent; first vein does not reach the middle of the wing; cross vein 53, last section of fifth vein 28, fourth vein from the cross vein to the fork 62 and from the fork to the wing margin thirty-two fiftieths of a millimeter.

Described from one male, taken by J. M. Aldrich, May 2, 1926, at Antigua, Guatemala.

Type.—Male, Cat. No. 41030, U.S.N.M.

PSILOPUS PANAMENSIS, new species

Male.—Length about 3.5 mm.; of wing 3.5–4 mm. Face green, usually blue on lower portion, where there is a little gray pollen, the suture near apical third, making the lower portion about as wide as long. Palpi and proboscis black. Front violet. Antennae black; bristles of second joint one and a half times as long as the antenna, third joint small, somewhat conical; arista dorsal, a little longer than width of head.

Thorax and abdomen dark green, the former with violet reflections and a little brown pollen; bristles of the thorax and abdomen numerous and rather long; sides of abdomen with long white hair, especially on basal part; scutellum with two pair of large bristles. Hypopygium (fig. 20) black, outer appendages brownish yellow, the small clavate appendages to the larger lamellae are yellow and fringed with long hairs.

Coxae, femora and hind tarsi black; tibiae and fore and middle tarsi brown; fore coxae with long white hair; all femora with some long white hairs below, those on anterior pair bristle-like, fore femora also have black hair on both sides, which is longer than the width of femora; fore tibiae with a row of six bristles of increasing length on upper surface, the longest ones being almost as long as second joint of fore tarsi; middle tibiae with three bristles above, two of which are as long as the longest on fore tibiae; hind tibiae with a row of slender bristles on basal two-thirds of lower anterior surface and a row of somewhat shorter hairs on the whole of lower posterior surface; fore tarsi with the fifth joint slightly widened; middle basitarsus with a few irregular and very small spines; joints of fore tarsi as 66–18–13–7–7; of middle ones as 82–26–19–9–5; joints of posterior pair as 67–27–18–9–8. Calypters, their cilia and the halteres black.

Wings grayish; costa without cilia; first vein reaching nearly to the middle of the wing; last section of fifth vein 20, cross vein 41, fourth vein from the cross vein to the fork 40, from the fork to wing margin twenty-five fiftieths of a millimeter long; cross vein oblique; fork of fourth vein bending backward a little so as to make the angle with fourth vein less than a right angle.

Described from six males, taken by Nathan Banks, July 4, and August 7 and 8, 1924, at Bella Vista, Panama.

Type.—In the Museum of Comparative Zoölogy.

Paratype.—Male, Cat. No. 41031, U.S.N.M.

PSILOPUS NITIDICAUDA, new species

Male.—Length 3.7 mm. Face green, seen from in front shining, viewed from above covered with silvery white pollen, which extends

a little above the antennae, its suture at the middle. Front green or blue-green, shining, except just above the antennae and at the vertex. I can see but one or two very small yellow hairs on each side. Antennae black; third joint small, second joint with one bristle below that is longer and one that is shorter than the antenna, those on upper edge of joint shorter; arista dorsal, about as long as the width of head. Palpi black with black hair; proboscis yellowish brown.

Thorax and abdomen shining green; dorsum of thorax with a little white pollen, which is visible when viewed obliquely; bristles of thorax black, of moderate length; scutellum with two pair of large bristles; abdomen with the base of second to fifth segments black; sixth segment mostly blue; hairs and bristles of the abdomen short, black, those on the basal half of the venter short and whitish. Hypopygium (fig. 21) and its lamellae shining black, the latter thin, nearly as large as the former, sometimes curled up so as to appear slender.

All coxae and femora and the hind tibiae black; fore coxae with rather short white hairs; all femora with long white hair below; tips of fore and middle femora, their tibiae and basitarsi yellow; fore and middle tarsi from the extreme tip of first joint and the whole of posterior tarsi black; fore tibiae with two small bristles on basal third of upper surface and two a little larger on lower posterior edge; middle tibiae with two rather small bristles on basal third and one at apical third of upper surface and four or five very small ones below; hind tibiae with several very small bristles; first joint of fore tarsi (fig. 22) with three long bristles below, one at base and two erect ones on apical half. second joint with six minute bristles below. Joints of fore tarsi as 59-17-17-11-8; those of middle ones as 56-23-18-11-7; joints of posterior pair as 62-23-17-10-7. Calypters and their cilia black, knobs of halteres yellow.

Wings (fig. 29) grayish with the usual brown crossbands connected on the costal margin; the hyaline space between them extends to third vein and is continued in front of it in a space where the brown is paler than that around it, which does not reach the second vein; hairs on the costa very short and recumbent.

Female.—Like the male in color, except that the abdomen is more bronzed; the posterior tibiae are sometimes brownish yellow and all tarsi are a little paler, the fore basitarsi have the same bristles below, but they are much shorter, not being longer than the diameter of the joint.

Described from 23 males and females, all taken by Nathan Banks. June 20 to August 7, 1924, at Barro Colorado Island, Panama Canal Zone.

Type.—In the Museum of Comparative Zoölogy.

Paratypes.—Male, female, Cat. No. 41032, U.S.N.M.

PSILOPUS FLAVIANNULATUS, new species

Male.—Length 5 mm.; of wing the same. Face blue with green reflections, more violet just below the antennae, covered with silvery white pollen when viewed obliquely, its suture near the middle. Front blue or violet. Palpi and proboscis yellow. Antennae yellow, third joint mostly brown, small, a little pointed at tip, second joint with a crown of short bristles; arista dorsal, scarcely as long as the width of the head.

Dorsum of thorax shining green with blue or violet reflections; bristles of thorax and abdomen short, those on posterior part of thorax a little longer; scutellum with one large and one small pair of bristles. Abdomen green, first segment mostly yellow, second yellow at base, the others with black incisures and coppery reflections. Hypopygium (fig. 23) dark brown with long outer appendages, which are yellow with a black tip, the inner appendages blackish.

All coxae, their bristles and hairs and all femora and tibiae yellow; all femora nearly bare below; middle femora with a row of short but stout black hairs on apical half of posterior surface; tibiae without bristles, except very short ones near the base of fore and middle pairs; fore and middle tarsi blackened from the tip of the first joint, posterior pair wholly blackish; fore tarsi with a row of short, flattened hairs, which do not reach the base or tip, fifth joint very slightly widened; other tarsi plain, except that the middle ones have short, delicate, but rather dense hair below on third and fourth joints. Joints of fore tarsi as 135-29-24-16-7; of middle ones as 132-48-40-21-10; joints of posterior pair as 98-41-26-15-8. Calypters and halteres yellow, the former with a black tip and long pale cilia.

Wings grayish hyaline; costa ciliated with erect hairs, which are bent at tip and begin near the middle of first vein, they become short recumbent hairs before the tip of second vein; first vein not one-third the length of the wing; cross vein oblique; last section of fifth vein 17, cross vein 53; fourth vein from the cross vein to the fork 53, from fork to wing margin nineteen-fiftieths of a millimeter long; fork of fourth vein bent backward so as to make less than a right angle with basal part of fourth vein, upper bend of fork with a stump vein.

Female.—Thorax less blue; bristles of fore coxae brown; costa without cilia, the hairs being all recumbent; tarsi plain.

Described from 2 males and 10 females, taken by Nathan Banks, July 6 and August 8, 1924, at Bella Vista, Panama Canal Zone; and

3 females, taken by C. M. Rouillard, at Obispo, La Providencia, Guatemala.

Type and allotype in the Museum of Comparative Zoölogy.

Paratypes.—Female, Cat. No. 41033, U.S.N.M., from Guatemala.

PSILOPUS CLAVATUS, new species

Male.—Length 4 mm.; of wing the same. Face green, when seen obliquely nearly covered with silvery white pollen, its suture a little above the middle. Palpi small, black; proboscis yellow. Front shining green. Antennae black, longest bristles on second joint about as long as the antenna, third joint small, rounded; arista dorsal, about as long as the width of the head.

Thorax and first five abdominal segments shining green, sixth and seventh violet; bristles of the thorax and abdomen moderately long; scutellum with two pair of large bristles. Hypopygium (fig. 24) brown with short brown appendages; venter brown.

Fore coxae, all femora and tibiae yellow, middle and hind coxae black; all femora with white hair below, which is as long as width of femora; fore tibiae with a row of four or more bristles on posterior surface, which are twice as long as the diameter of tibia; middle tibiae with a row of 15 bristles on anterior surface, which are twice as long as diameter of tibia; hind tibiae with a small bristle near the base, one at apical fourth and one near the tip; extreme tip of hind tibiae black; fore and middle tarsi infuscated from the tip of first joint; hind tarsi wholly black; fore tarsi (fig. 25) with a long bristle near the base and a still longer one at about apical fourth, last joint slightly widened; middle basitarsi with four or five short bristles below; hind tarsi (fig. 26) with the last three joints considerably flattened and widened; joints of fore tarsi as 92-32-22-11-7; those of middle ones as 102-27-21-12-6; joints of posterior tarsi as 81-28-11-12-9. Calypters yellow with tip and cilia black; halteres wholly yellow.

Wings grayish with the usual crossbands faintly marked; the hyaline space between them reaches third vein; they fill out the space in front of the fork of fourth vein, extending back as an infuscation of the first part of this fork, of the cross vein and last section of fifth vein to wing margin; cross vein 30, last section of fifth vein 18, fourth vein from the cross vein to the fork 62 and from fork to wing margin twenty-three fiftieths of a millimeter long; the last section of fifth vein ends abruptly at one-third the distance to the wing margin; fork of fourth vein bends backward so as to make less than a right angle with basal part of fourth vein; upper bend of fork with a

stump vein; first vein reaching two-fifths the length of the wing; costa with minute hairs.

Described from one male, taken by Nathan Banks, August 6, 1924, at Ancon, Panama Canal Zone.

Type.—In the Museum of Comparative Zoölogy.

PSILOPUS SIMULANS, new species

Male.—Length 4 mm; of wing the same. Face green, sometimes blue below, covered with silvery white pollen when viewed obliquely, the suture near the middle. Palpi black, proboscis brownish yellow. Antennae black, second joint with bristles as long as the antenna, third joint small, rounded; arista dorsal, a little longer than width of head. Front shining green.

Thorax and abdomen shining green with coppery reflections and short bristles; abdominal segments with broad basal black bands; last segment more blue. Hypopygium (fig. 27) and its large, rounded lamellae mostly shining black, the lamellae with long bristles at tip.

Coxae and femora black; tips of fore and middle femora and all tibiae yellow; fore and middle tarsi black from the tip of first joint; extreme tips of posterior tibiae and their tarsi black; fore coxae with long white hair; all femora with white hair below, which is scarcely as long as width of femora; fore tibiae with two slender bristles on lower posterior edge, which are longer than their diameter, and two shorter ones near the base on upper anterior edge; middle tibiae with three bristles on upper anterior edge which are nearly twice as long as the diameter of the tibia and several very short ones below; posterior tibiae with two very short bristles, one at basal fourth and one near the middle; fore tarsi (fig. 28) with three long bristles below on first joint, and very small spines on the two following joints; middle basitarsi with minute, irregular bristles; joints of fore tarsi as 61-18-20-14-8; those of middle ones as 78-25-17-15-7; joints of posterior pair as 60-23-17-9-8. Calypters and their cilia black; halteres yellow.

Wings grayish with the usual crossbands, the hyaline space between them reaches the third vein and is rather narrow between third and fourth veins, the first band reaches the tip of first vein; venation very much like that of *clavatus*, new species; cross vein 35, last section of fifth vein 16, fourth vein from the cross vein to fork 48, from fork to wing margin twenty-three fiftieths of a millimeter long; the portion of fourth vein beyond the fork nearly reaches the wing margin; upper bend of fork rounded; first vein about two-fifths the length of the wing.

Described from two males, taken by Nathan Banks, June 20 and 21, 1924, at Barro Colorado Island, Panama Canal Zone.

Type.—In the Museum of Comparative Zoölogy.

This is very much like *digitatus* Van Duzee; it differs from that form in having the hypopygial lamellae broad and rounded, while in *digitatus* they are short and linear.

Genus DIAPHORUS Meigen

Diaphorus MEIGEN, Syst. Besch., vol. 4, 1824, p. 32.—LOEW, Mon. North Amer. Diptera, p. 2, 1864, pp. 159, 169 (*Diaphorus* and *Lyroneurus*).—ALDRICH, Kansas Univ. Sci. Bull., vol. 1, 1902, p. 85, table of North American species.—VAN DUZEE, Bull. Buffalo Soc. Nat. Sci., vol. 11, 1915, pp. 161–194, table of species.

DIAPHORUS OPACUS Loew

Diaphorus opacus LOEW, Mon. North Amer. Diptera, pt. 2, p. 160, 1864.

J. M. Aldrich took this May 16, 1926, at La Providencia, Obispo, Guatemala.

DIAPHORUS COERULESCENS Loew

Diaphorus coerulescens LOEW, Mon. North Amer. Diptera, pt. 2, p. 170, 1864.

J. M. Aldrich took two May 1, 1926, at El Salto, Antigua, Guatemala.

DIAPHORUS SPECTABILIS Loew

Diaphorus spectabilis LOEW, Mon. North Amer. Diptera, pt. 2, p. 162, 1864.

J. M. Aldrich took a number of these April 14 and 16, 1926, at La Providencia, Obispo, Guatemala.

DIAPHORUS SIMPLEX Aldrich

Diaphorus simplex ALDRICH, Trans. Entom. Soc. London, 1896, p. 333.

J. M. Aldrich took two May 7, 1926, at Quirigua, Guatemala; Nathan Banks took one pair July 3 and 29, 1924, at Barro Colorado Island, Panama Canal Zone.

DIAPHORUS CURVISPINA, new species

Male.—Length 3.5 mm. Face wide, green with silvery white pollen. Front shining green, about as wide as the face. Palpi black with white pollen. Antennae black, third joint flattened at tip, about three times as wide as long; arista apical.

Thorax and abdomen green, a little dulled with grayish white pollen; hairs of the abdomen black. Hypopygium and its appendages small, bristles at tip of abdomen stout but not very long.

All coxae and femora metallic green; fore coxae with a few small pale hairs; tips of femora and all tibiae yellow, posterior tibiae a little brownish at tip on outer side, their tarsi yellow at base; pulvilli of fore tarsi a little enlarged; posterior basitarsi with a long curved bristle below near the base, fully three-fourths as long as the joint; joints of fore tarsi as 58-22-15-9-7; of middle ones as 51-23-16-7-6; those of posterior pair as 37-24-15-8-7; the long bristles of hind basitarsus as 28. Calypters and halteres yellow, the former with black cilia. Wings grayish; third and fourth veins each bent away from the other beyond the cross vein, becoming more parallel toward their tips; last section of fifth vein 33, cross vein twenty-fiftieths of a millimeter long; first vein not reaching beyond one-third of the distance to tip of second vein.

Female.—Very much like the male, except that the third and fourth veins are almost exactly parallel beyond the cross vein; the face is distinctly divided near the middle, and there is no spine on lower surface of hind basitarsi.

Type and *allotype*, taken by J. M. Aldrich, April 14 and 15, 1926, at La Providencia, Obispo, Guatemala. Three *paratypes* were taken by Nathan Banks in the Panama Canal Zone; one male on Taboga Island, June 29, 1924; one female at Barro Colorado Island, and one female at Fort Sherman, July 3, 1924.

Type.—Male, Cat. No. 41034, U. S. N. M. This would run to *simplex* Aldrich, which is very much like it, but this differs in having the spine of lower surface of posterior basitarsi much longer and curved, not erect as in *simplex*, and the third and fourth veins are not so much bent as in that species.

DIAPHORUS PERPLEXUS, new species

Male.—Length 3.5 mm. Face and front green, of nearly equal width, the former slightly narrowed below and covered with white pollen; front shining with only a little yellowish pollen. Antennae wholly black, third joint evenly rounded at tip, twice as wide as long; arista apical. Palpi black with white pollen. Lower orbital cilia white.

Thorax green, a little dulled with yellowish pollen. Abdomen shining green with bronze reflections, last two segments more blue, its hair black. Hypopygium conspicuous but small, its appendages small.

All coxae and femora black with green reflections, their tips and the trochanters yellow; a few minute pale hairs on fore coxae and one black bristle at tip; fore femora with a row of black hairs below, which are short, except at base; tibiae yellow, posterior pair brown at tip; fore and middle tarsi from the tip of first joint and most of

hind tarsi black; first joint of hind tarsi with an erect bristle below near the base, which is half as long as the joint and slightly curved; joints of fore tarsi as 41-23-18-10-8; those of middle ones as 42-23-15-8-7; joints of posterior pair as 33-25-13-7-5, their spine as 17. Calypters and halteres yellow, cilia of the former black. Pulvilli of fore tarsi scarcely enlarged.

Wings grayish, slightly brownish in front of third vein; first vein reaching one third of the distance to tip of second vein; third vein running quite close to second vein to near the tip of that vein then quite abruptly bending backward; last section of fourth vein nearly straight, only a little arched forward in the middle, therefore not parallel with third vein; cross vein 22, last section of fifth vein twenty-nine fiftieths of a millimeter long.

Described from one male, taken by Nathan Banks, July 3, 1924, at Fort Sherman, Panama Canal Zone.

Type.—In the Museum of Comparative Zoölogy.

This is nearly like *simplex* Aldrich, but the third and fourth veins are much nearer parallel, the third vein not being greatly bent as in that species and the bristles at tip of abdomen are also very small.

DIAPHORUS VARIPES, new species

Male.—Length 3.5 mm. Face wide, silvery white, a little longer than wide; eyes contiguous above the antennae. Proboscis and palpi black. Antennae wholly black, third joint flattened or a little concave at tip, arista apical; lower orbital cilia white.

Thorax and scutellum bright green with white pollen; bristles of thorax strong and black. Abdomen more bronze color or coppery, its hairs black, those on the venter long and white; hypopygium and its appendages small; bristles at tip of abdomen strong.

Fore coxae yellow, blackened on outer surface almost to tip, its hairs few and pale, bristles at tip black; middle and hind coxae black; fore femora wholly yellow with long pale hairs below; middle femora yellow at base and on most of apical half, black in the middle; hind femora yellow with upper surface of apical half black, except at extreme tip; all tibiae and more or less of first tarsal joint yellow, tarsi blackish beyond the tip of first joint; middle tibiae with one large bristle near the base on upper anterior edge; pulvilli of fore and middle tarsi longer than their fifth joint, those of posterior tarsi a little shorter; joints of fore tarsi as 45-16-14-10-5; those of middle pair as 52-24-17-8-6; joints of posterior pair as 34-30-29-10-8. Calypters, their cilia and the halteres yellow.

Wings grayish; third and fourth veins parallel, fourth ending in the apex of the wing; first vein reaching one-third the distance to tip

of second; last section of fifth vein 37, cross vein twenty-five fiftieths of a millimeter long.

Described from one male taken by Nathan Banks, July 13, 1924, at Barro Colorado Island, Panama Canal Zone.

Type.—In the Museum of Comparative Zoölogy.

This form is remarkable for the color of its legs.

Genus *ASYNDETUS* Loew

Asyndetus LOEW, Centuries, 8, 1869, No. 58; Besch. Europ. Dipt., vol. 2, 1871, p. 296.—WHEELER, Proc. California Acad. Sci., vol. 2, 1897, p. 32.—ALDRICH, Kansas Univ. Sci. Bull., vol. 1, 1902, p. 87.—VAN DUZEE, Psyche, vol. 23, 1916, p. 88; Ent. News, vol. 30, 1919, 248.

ASYNDETUS FLAVITIBIALIS, new species

Female.—Length 4.5 mm. Face about as wide as the front, narrowed a little below and quite pointed, covered with whitish pollen, its suture below the middle. Palpi large, yellow with pale hairs; proboscis black; front blackish, covered with whitish pollen. Antennae wholly black, third joint nearly round, a little flattened at tip; arista dorsal, as long as the face. Orbital cilia and beard white.

Thorax and abdomen green with coppery reflections, the former with two coppery lines on the dorsum; hind margins of abdominal segments broadly and densely white pollinose; bristles of thorax and tibiae black; all hairs of abdomen, coxae, femora, tibiae and tarsi yellow.

Coxae and femora greenish black, extreme tips of coxae, the trochanters, base and tips of femora, all tibiae and tarsi yellow, tips of fore and middle tarsi and most of last four joints of posterior tarsi infuscated; joints of fore tarsi as 22-7-6-5-5; of middle tarsi as 44-18-14-8-9; joints of posterior tarsi as 35-39-22-12-11. Calyp- ters and halteres yellow, the former with white cilia.

Wings grayish, veins yellow, costa brownish yellow; third vein straight and parallel with second vein to tip of that vein, then bending sharply backward, so as to run nearly parallel with costa and uniting with it at about three-fourths the distance from tip of second vein to the apex of wing; fourth being quite strong for the genus, broken opposite tip of second vein, the last part overlapping the basal part and parallel with it, but not quite reaching the wing margin, which it would touch far back of the apex of the wing; cross vein placed opposite apical fifth of first vein.

Described from two females, taken by A. Busck, February 15, 1912, on Tabogilla Island, Panama.

Type.—Female, Cat. No. 41035, U.S.N.M.

This would run to *latus* Van Duzee, but differs in being larger, in having the fourth vein stronger and completely broken, third

vein running closer to second vein and extending nearer to the apex of the wing, and the cross vein farther from the base of the wing.

Genus *CHRYSOTUS* Meigen

Chrysotus MEIGEN, Syst. Besch., vol. 4, 1824, p. 40.—LOEW, Monographs, vol. 2, 1864, p. 171.—ALDRICH, Kansas Univ. Sci. Bull., vol. 1, 1902, pp. 85, 88.—VAN DUZEE, Bull. Buffalo Soc. Nat. Sci., vol. 13, 1924, p. 1, revision with key.

CHRYSOTUS CONTRACTUS, new species

Male.—Length 2.5 mm. Face green, quite wide above, narrow below; palpi yellow, proboscis black; front green; antennae wholly black, formed as in *barbatus* Loew, third joint with a somewhat globular base, then suddenly contracting into a long slender point, at tip of which is the arista, which is scarcely as long as the narrow part of third joint; lower orbital cilia and beard long, white.

Thorax and abdomen bright green, dorsum of thorax with thin brown pollen; hairs of the abdomen black, but appearing reddish-yellow in certain lights; hypopygium small, its hairs yellow, it has small, yellowish lamellae projecting downward.

Coxae black, anterior pair more green with yellow tips and white hair; trochanters yellow; femora green, apical third of anterior and apical half of middle pair yellow; posterior femora with a cluster of long black hairs or bristles near the middle of anterior surface of lower edge and two bristles near the tip; tibiae yellow, broad base and narrow tip of posterior pair blackened, anterior pair with apical half more or less infuscated; middle tibiae (fig. 54) swollen below at the middle, then narrowed and again a little wider, this part appearing about normal, they have a large bristle above near basal third and two rows of very small spines below; all tarsi blackish from the tip of the first joint; middle basitarsus (fig. 54) arched and enlarged at base and tip, it also has a continuation of the two rows of little spines on lower surface, but they are very small, except at base and tip; fore tibiae and basitarsus also have two rows of minute inconspicuous spines below; joints of fore tarsi as 18-7-5-4-4; those of middle ones as 25-12-9-5-5; those of posterior tarsi as 22-14-7-5-5. Calypters, their cilia and the halteres yellow.

Wings slightly grayish; third and fourth veins parallel, fourth ending in the apex of the wing; cross vein nearly at the middle of the wing; first vein reaching scarcely beyond basal fourth of wing; last section of fifth vein 18, cross vein twelve-fiftieths of a millimeter long.

Female.—Face and palpi about as in the male; third antennal joint small, about as long as wide, rounded at tip; arista apical, normal; thorax and its pollen as in the male; cilia of the calypters black;

fore and middle femora black with narrow yellow tips; posterior femora without the cluster of bristles at their middle and with only one bristle at tip; tibiae and tarsi pale yellow, plain, tarsi a little darkened toward their tips; last section of fifth vein 31, cross vein twelve-fiftieths of a millimeter long.

Described from two males and one female, taken by J. M. Aldrich, April 16, 1926, at La Providencia, Obispo, Guatemala.

Type.—Male, Cat. No. 40136, U. S. N. M.

This is very much like *Achradocera meridonalis* Becker¹ which has the middle tibiae and basitarsi formed about the same; but according to Doctor Becker that species has the face dull brown; the cilia of the calypters black; tibiae and tarsi yellow, at least the description does not mention the infuscation of the tips of fore and middle tibiae and of all tarsi, except their base, which is very conspicuous in this form; his figure shows less constriction of the tibiae and no large bristle above; in *meridonalis* the hypopygial lamellae are black, in this they are yellow.

CHRYBOTUS FLAVIMACULATA, new species

Male.—Length 3–4 mm. Face narrow, a little wider above, white; palpi as long as width of third antennal joint, silvery white; front shining, green or bronze color; antennae wholly black, third joint rounded at tip, not as long as wide; arista apical; lower orbital cilia white.

Thorax shining green, the anterior half more or less reddish coppery; pleurae dulled with white pollen. Abdomen shining green with coppery reflections on basal half; second segment with a large yellow triangle on each side, which are widely separated on the dorsum or sometimes they may meet above; hypopygium small, black, appendages small.

Fore coxae, and all femora, tibiae, and tarsi yellow, tarsi darkened at tip; posterior edge of pleurae and most of hind coxae yellow; fore coxae nearly bare with black bristles at tip; fore femora with longer hair below than above; fore tibiae without bristles, those of middle and hind ones large; pulvilli of fore tarsi yellow, distinctly enlarged; joints of fore tarsi as 39–21–15–11–7; those of posterior pair as 27–23–15–8–6.

Wings grayish; third and fourth veins parallel, fourth ending in the apex of the wing; cross vein in the middle of the wing; first vein reaching a little more than half way to tip of second; last section of fifth vein 27, cross vein eighteen-fiftieths of a millimeter long.

Described from five males, taken by Nathan Banks, July 8–27, 1924, at Barro Colorado Island, Panama Canal Zone.

Type.—In the Museum of Comparative Zoölogy.

¹ Becker's *Dolichopodidae* of America, 1921, p. 208.

This has the third and fourth veins quite far apart as in *Diaphorus* and has the fore pulvilli slightly enlarged, otherwise it is a typical *Chrysotus*.

Genus ARGYRA Macquart

Argyra MACQUART, Hist. Nat. Dipt., vol. 1, 1834, p. 456.—LOEW, Mon. N. Am. Diptera, pt. 2, 1864, p. 123, table of species.—VAN DUZEE, Proc. U. S. Nat. Mus., vol. 66, 1925, pp. 1-23, table of N. A. species.

ARGYRA VIOLACEA, new species

Female.—Length 5 mm. Face silvery white, rather narrow, wider below, the portion below the suture about two-thirds as long as upper part; palpi large, black, covered with white pollen and black hair; proboscis yellow; front violet with thin white pollen; first two antennal joints black, first with many hairs above (third joint missing in type); lower orbital cilia long and white.

Dorsum of thorax and scutellum wholly shining violet; pleurae more blue-green, dulled with white pollen, pleural sutures and posterior edge of pleurae yellow; scutellum bare with two large marginal bristles; propleurae largely yellow; humeri surrounded with yellow. Abdomen yellow, second to fifth segments black above on anterior edge, the black extending to posterior margin in the middle, narrowly so on second segment, more widely on each succeeding segment.

Coxae yellow, middle ones with a blackish streak on outer surface; anterior surface of fore coxae with short white hair, hairs of middle ones and bristles of all coxae black; all femora yellow with short hair; fore and middle tibiae yellowish-brown, posterior ones brown; all tarsi black or dark brown; joints of fore tarsi as 99-33-29-16-12; of middle ones as 123-43-32-12-8; joints of posterior pair as 28-79-48-21-12. Calypters small, black with long black cilia; halteres pale yellow.

Wings dark gray; third vein bent backward at tip; last section of fourth vein bent near its middle, the part beyond this bend nearly straight and approaching third vein toward its tip, ending just back of the apex of the wing; last section of fifth vein 30, cross vein thirty-nine fiftieths of a millimeter long; wing narrow at base, so that the sixth vein runs parallel with the wing margin, its tip continued as a thin fold, which curves abruptly to the wing margin about opposite the middle of first vein.

Described from one female, taken by C. M. Rouillard, at La Providencia, Obispo, Guatemala.

Type.—Female, Cat. No. 41037, U.S.N.M.

This species is remarkable for the short posterior basitarsi.

KEIROSOMA, new genus

This would come near *Nematoproctus*, from which it differs in having the abdomen compressed and cut off abruptly at tip, in the male at least. The first antennal joint is bare above; arista dorsal; third antennal joint formed as in *Nematoproctus*, the thorax also of the same bright green color, with silvery-white pollen along the front. Bristles on the posterior margins of the abdominal segments very strong; hypopygium concealed, or mostly so, its appendages rather short, not filiform as in *Nematoproctus*; wings rather wide; cross vein slightly beyond the middle of the wing and not as long as last section of fifth vein; sixth vein strong but not reaching the wing margin; third and fourth veins nearly parallel, but slightly divergent at their tips; first joint of hind tarsi shorter than second.

This would run to *Chrysotus* in tables of species; it differs in being large, very bristly, with the abdomen compressed, cut off squarely at tip, not at all tapering in the male; the cross vein is beyond the middle of the wing, not before the middle, as in *Chrysotus*; the tip of fourth vein is a little beyond the apex of the wing.

The name has reference to the truncated abdomen of the male.

Genotype.—*Keirosoma albicinctum*, new species.

KEIROSOMA ALBICINCTUM, new species

Male.—Length 6 mm.; of wing 5 mm. Eyes touching for a short distance below the middle of the face, the slender triangle above and short line below silvery white; palpi small, yellowish brown; front shining green; antennae (fig. 75) short, yellow, brown at tip, placed at upper fifth of eye height; orbital cilia short, wholly black; one pair of short post-vertical bristles; one pair of long ocellar bristles curving backward; and one pair of orbital bristles curving inward and forward, crossing each other before their tips.

Dorsum of thorax shining green with blue and bronze reflections and silvery white pollen along the front; pleurae more black with gray pollen; acrostichal bristles in two rows, rather large; five dorsocentral bristles on each side, the anterior one stout but not long, they become long posteriorly; scutellum large, somewhat truncate at tip, green with violet in the middle, one pair of very large marginal bristles. Abdomen compressed, cut off abruptly at tip (fig. 76), five visible segments, which are blackish purple with a rather narrow green base and some green reflections on the purple portion; the green base is opaque with white pollen when viewed from above, this white pollen narrowly interrupted on the middle of the dorsum; posterior margin of all segments with a row of very long bristles; all hairs and bristles of thorax, abdomen, legs, and feet black.

Fore coxae wholly yellow, middle ones largely black, posterior pair yellow, blackened on outer surface; all femora and tibiae yellow; posterior tibiae black at tip; hind femora with long hair above and below; fore tibiae with a row of four bristles of increasing length on upper anterior edge and three smaller ones on upper posterior edge; middle tibiae with two irregular rows of bristles above and a row of four below, which increase in length apically; posterior tibiae with two rows of about six long bristles above, between these is a glabrous stripe, they have long bristly hair below, which is longer apically; fore tarsi wholly yellow, middle ones more brown, even at base, posterior pair wholly black; joints of fore tarsi as 50-16-14-9-10; of middle ones as 62-35-27-13-13; joints of posterior pair as 45-54-41-23-13. Halteres wholly yellow; calypters black with long, dense, black cilia, which are bent backward at tips.

Wings grayish, slightly tinged with brown in front; third vein straight; last section of fourth vein with a very slight bend beyond its middle, it reaches the wing margin beyond the apex of the wing, and as it runs straight from base to tip (except for the slight bend near its apex) it is nearly uniformly divergent from third vein for its entire length; first vein reaches two-thirds the distance to the cross vein, which is a little beyond the middle of the wing and at right angles to fifth vein; fifth vein only gently arched, its last section not bent backward any more than the basal portion; cross vein as 33, last section of fifth vein as 48; sixth vein distinct and quite strong, but tapering and ends before the wing margin; in front of the sixth vein is a fold in the wing which reaches the wing margin and when viewed from the right direction it appears like a rather strong vein.

Described from two males; one, the type, was taken by C. T. Greene on Barro Colorado Island, Canal Zone, April 16, 1926; the other was collected by Mrs. Annie Trumbull Slosson at Biscayne Bay, Fla. She sent this specimen many years ago to J. M. Aldrich, in whose collection it remained, marked "New Genus."

Type.—Male, Cat. No. 41038, U.S.N.M.

Genus SYMPYCNUM Loew

Sympycnum LOEW, Neue Beitr., vol. 5, 1857, p. 42; Mon. North Amer. Diptera, pt. 2, 1864, p. 185, table of species.—WHEELER, Proc. California Acad. Sci., vol. 2, 1899, p. 47, table of species.

SYMPYCNUM IMPERFECTUS, new species

Male.—Length 3.7 mm. Face very narrow, of nearly equal width, silvery white. Palpi and proboscis black, the former with white pollen. Antennae black, third joint small, about as long as wide, somewhat triangular, obtusely pointed at tip. Lateral and inferior orbital cilia long, white.

Thorax green, dorsum covered with brown pollen, pleurae with white pollen. Abdomen green, dorsum with coppery reflections, except the last segment; hairs of the abdomen and hypopygium black, a few on the venter pale. Hypopygium small with small, black lamellae, which project downward and curve backward at tip.

Coxae, basal half or more of fore femora and upper surface of posterior femora black; apical part of fore femora, their tibiae, base of fore tarsi and middle femora and tibiae yellow; extreme tips of middle tibiae, fore and middle tarsi and posterior tibiae yellowish brown; last joint of fore and middle tarsi, tips of posterior tibiae and the whole of posterior tarsi black; last joint of middle tarsi (fig. 30) flattened and widened; hairs and bristles on fore and middle coxae white, hairs of fore coxae rather long; femora nearly bare below; bristles of posterior tibiae fully as long as the diameter of the tibia; length of fore tibiae as 52, joints of fore tarsi as 31-12-9-8-8; those of middle ones as 47-22-17-11-11; joints of posterior pair as 34-28-18-12-11. Calypters yellow with brown tips and yellow cilia; halteres yellow.

Wings (fig. 31) more brown in front, otherwise grayish; third vein bent back, then recurved forward at tip; fourth vein slightly arched, ending in the apex of the wing; last section of fifth vein extending only about one-third of the distance from the cross vein to wing margin, the length of this portion 7, to wing margin 23, cross vein twenty-seven fiftieths of a millimeter, cross vein somewhat arched.

Female.—Face wide, dark gray; cilia of the calypters black; last section of fifth vein complete to wing margin, a little shorter than the cross vein; cross vein more distinctly clouded than in the male, also a faint, clouded spot on the middle of last section of fourth vein; posterior tibiae yellow with a black tip; fore and middle tarsi black from the tip of the first joint; second joint of posterior tarsi a very little shorter than first; fifth joint of middle tarsi plain, a little shorter than fourth.

Described from one pair, taken October 24, 1926, at Angol, Chile, by D. S. Bullock.

Type.—Male, Cat. No. 41039, U.S.N.M.

SYMPYCINUS LONGIPES, new species

Male.—Length 4.5-4.8 mm. Face very narrow, eyes almost touching on lower part of the face, face and palpi silvery white; proboscis blackish, front obscured with grayish pollen. Antennae (fig. 32) wholly black, third joint about as long as wide, somewhat triangular; arista inserted at base of third joint; lower orbital cilia white.

Thorax dull green, its pollen brown, leaving two indistinct vittae, one each side of a narrow, median line of brown pollen, its bristles long, black; pollen on the pleurae white. Abdomen green, sometimes the first and second segments appear blackish in certain lights; base of the other segments broadly blackish purple on the middle of the dorsum, but this color scarcely reaches the lower edge on the sides; abdomen with numerous pale hairs. Hypopygium small, its appendages small, partly black and partly yellowish, sometimes concealed.

Fore coxae, all femora, fore and middle tibiae and most of anterior tarsi pale yellow; fore coxae with conspicuous white hair; fore and middle coxae with yellow bristles at tip, posterior ones with one erect, black bristles on outer surface; middle and hind coxae greenish with yellow tips; upper edge of hind femora at tip and their tibiae brown, the tibiae more yellowish on basal part; first three joints of middle tarsi brown, fourth (fig. 33) whitish, widened, fifth black, still broader, oval; hind tarsi wholly black; joints of fore tarsi as 40-16-11-5-6; those of middle ones as 69-32-28-10-11; joints of posterior pair as 58-32-29-14-8; calypters and halteres yellow, cilia of the former pale yellow.

Wings dark grayish; second vein running rather close to the costa; third vein bent back toward its tip, then forward near the wing margin; tip of fourth vein before the apex of the wing; last section of fifth vein bowed backward in the middle, it is $\frac{55}{200}$, cross vein twenty-four fiftieths of a millimeter long; wing narrow at base, widest just back of the tip of fifth vein.

Female.—Face a little wider than in the male; middle and hind tibiae yellow with extreme tip brown or black; joints of posterior tarsi as 45-32-21-11-10; fore coxae slightly darkened on basal half; cilia of calypters appear black in certain lights, yellow when viewed in other lights; wings broader, especially at base; anal angle quite prominent; second vein running at the normal distance from the costa; third vein only bent back a little toward the tip; fourth vein ending in the apex of the wing; last section of fifth vein bent backward at its middle as in the male.

Described from four males and two females, taken October 24, 1926, at Angol, Chile, by D. S. Bullock.

Type.—Male, Cat. No. 41040, U.S.N.M.

SYMPYCNUM FILIFORMIS, new species

Male.—Length 2.3 mm. Eyes contiguous; palpi white; proboscis brown; front black with brown pollen; antennae (fig. 34) yellow, third joint brown, triangular, nearly twice as long as wide.

Thorax green with thick yellowish brown pollen; humeri, edge of scutellum and more or less of the margins of the dorsum reddish yellow; pleurae largely yellow. Abdomen brown, venter and basal half of second segment yellow. Hypopygium (fig. 35) rather large, black with long yellow filamentlike appendages extending forward under the abdomen and reaching nearly to its base; these are fringed with long hairs.

Coxae, femora, and tibiae pale yellow; posterior femora and tibiae darker yellow; fore coxae with several black bristles at tip; femora nearly bare below; bristles of middle and hind tibiae very small; tarsi black from the tip of the first joint; fore tarsi (fig. 36) with the second joint swollen below on basal half and with long, bristly, black hairs on upper apical part of the joints; fore tibiae as 50; joints of fore tarsi as 26-14-11-7-9; those of middle tarsi as 38-18-16-9-6; joints of posterior pair as 19-25-19-10-8. Halteres yellow; cilia of the calypters black.

Wings grayish; third and fourth veins nearly parallel, third bent back a little near the tip, fourth ending in the apex of the wing; last section of fifth vein 24, cross vein fourteen-fiftieths of a millimeter long; anal angle of wing not at all prominent, the wing being narrowed at base.

Described from one male, taken by J. M. Aldrich, May 1, 1926, at El Salto, Antigua, Guatemala.

Type.—Male, Cat. No. 41042, U.S.N.M.

SYMPYCNUM BIPILUS, new species

Male.—Length 2 mm. Eyes contiguous, leaving a narrow whitish triangle below the antennae; palpi whitish; front black with gray pollen; antennae (fig. 37) yellow, third joint brown at tip, about as long as wide, somewhat triangular.

Thorax green, color obscured by brown pollen, which forms indistinct vittae; abdomen black; hypopygium small, lamellae small, yellow.

Coxae, femora and tibiae yellow, posterior femora blackish above; femora nearly bare below; posterior tibiae with only very short bristles, those on middle tibiae longer; fore and middle tarsi infuscated from the tip of the first joint; posterior tarsi (fig. 38) mostly black, second joint with two long white hairs at tip below, which are longer than the joint and extend backward; fore tibiae as 45; joints of fore tarsi as 16-4-4-3-5; joints of middle ones as 29-12-12-6-6; those of posterior pair as 19-13-15-13-10, hairs at tip of second joint as 15.

Wings uniformly tinged with brown; third and fourth veins parallel, fourth ending in the apex of the wing; last section of fifth vein

17, cross vein thirteen-fiftieths of a millimeter long; anal angle of wing not at all prominent.

Described from one male taken by J. M. Aldrich, May 1, 1926, at El Salto, Antigua, Guatemala.

Type.—Male, Cat. No. 41042, U.S.N.M.

Genus NOTHOSYMPYCNUM Wheeler

Nothosympycnum WHEELER, Proc. California Acad. Sci., vol. 2, 1899, p. 51.

NOTHOSYMPYCNUM UNIPILUS, new species

Male.—Length 3 mm. Face narrow, silvery white, its sides parallel; front bright shining blue-green; first antennal joint black (other joints broken off).

Dorsum of thorax shining blue-green, a little dulled with brown pollen; pleurae green with gray pollen. Abdomen and hypopygium blackish bronze, basal segments more brown, venter yellow. Hypopygium rather large, shining, its hairs pale, appendages very small, yellow.

Coxae, femora and fore and middle tibiae yellow; tips of posterior femora, and the posterior tibiae brownish; fore coxae with minute yellow hairs, without black bristles at tip; femora nearly bare below; bristles of posterior tibiae nearly as long as the diameter of the tibia; fore tarsi (fig. 41) black from the tip of the third joint, which has a long pale hair below near its middle; fore tibiae as 37; joints of fore tarsi as 4-31-11-15-7; first two joints of posterior tarsi as 21-25. Halteres yellow.

Wings slightly tinged with brown; third and fourth veins parallel, fourth ending in the apex of the wing; last section of fifth vein 37, cross vein ten-fiftieths of a millimeter long; wing narrowed at base.

Described from one male taken by J. M. Aldrich, May 1, 1926, at El Salto, Antigua, Guatemala.

Type.—Male, Cat. No. 41043, U.S.N.M.

This is very much like *furcatus*, new species, but the apical joints of fore tarsi are a little thicker, the third has a long hair below; this has small but distinct yellow hypopygial lamellae, while those of *furcatus* seem to be all black; the last section of fifth vein is a very little longer and the cross vein shorter in this form; the face is silvery white in this and more yellowish in *furcatus*.

NOTHOSYMPYCNUM FURCATUS, new species

Male.—Length 2.5 mm. Face wider above, narrow below, yellowish; front dark shining blue, almost violet, ocellar tubercle black; antennae broken off in the type.

Thorax blue-green dulled with brown pollen; pleurae green with gray pollen. Abdomen and hypopygium blackish bronze, the latter with pale hairs; base of abdomen yellowish brown, venter yellow; appendages of the hypopygium very small, black.

Coxae, femora, fore and middle tibiae and most of fore tarsi yellow; tips of posterior femora and most of their tibiae brown; middle and hind tarsi mostly black; bristles of posterior tibiae numerous and some of them nearly as long as the diameter of the tibia; fore tarsi (fig. 39) with the fourth joint a little longer than third and with little hooked hairs on upper surface; middle tarsi (fig. 40), second and third joints each with a thumblike fork or projection at tip, that on second reaching nearly to tip of third joint, that on third nearly half as long as fourth joint, each with long hairs at their tips; joints of fore tarsi as 3-30-13-14-6; those of middle ones, without the projections as 43-13-5-7-8; joints of posterior pair as 21-26-12?12?-7. Calypters yellow with a black tip and cilia; halteres yellow.

Wings slightly tinged with brown; third and fourth veins parallel, fourth ending in the apex of the wing; last section of fifth vein 35, cross vein eleven-fiftieths of a millimeter long; wing narrow at base.

Female.—Face wide, its pollen whitish; color of the front, thorax, abdomen and legs about as in the male; wings as in the male; fore tarsi black from the tip of the first joint; middle tarsi brown, hind tarsi black; joints of fore tarsi as 25-12-6-6-6; of middle ones as 32-12-10-6-6; joints of posterior pair as 19-23-12-9-8.

Described from one pair taken by J. M. Aldrich, May 1, 1926, at El Salto, Antigua, Guatemala.

Type.—Male, Cat. No. 41044, U.S.N.M.

Genus NEURIGONA Rondani

Neurigona RONDANI, Dipt. Ital. Prod., vol. 1, 1856, p. 142.—WHEELER, Proc.

California Acad. Sci., vol. 2, 1899, p. 72, table of species.—VAN DUZEE, Annals Ent. Soc. Amer., vol. 6, 1913, p. 22, table of species.

Saucropus LOEW, Monog. North Amer. Diptera, vol. 2, 1864, p. 224, table of species.

NEURIGONA BANKSI, new species

Male.—Length 4.2 mm. Eyes broadly contiguous, very nearly obliterating the face; front dark blue-green; palpi yellow; antennae yellow, third joint mostly brown, small, scarcely as long as wide, somewhat conical in outline.

Thorax yellow, darker on the dorsum; the depressed space before the scutellum a beautiful blue-green, entire disk of scutellum of same color, except a very narrow margin of yellow, also a narrow median

line of the same color on the dorsum of the thorax, extending forward from the depressed space and tapering to a point before reaching half-way to anterior edge of thorax, but in certain lights it can be traced all the way; lower surface of scutellum and the metanotum yellow, the latter with a very fine median metallic line. Abdomen yellow; second segment with a purplish black band which takes up more than half the dorsum of the segment, but tapers to a point on the sides; third and fourth segments of the same purplish color with only the posterior margins yellow; fifth segment very small, sixth seeming to form a part of the hypopygium, it is yellow, infuscated at tip and near the venter and covered with pale hairs; the rest of the hair on the abdomen is black. Hypopygium (fig. 42) black, with very small white lamellae, which are fringed with white hairs.

Coxae, femora and tibiae yellow with black hair and bristles; tarsi brown; fore tibiae as 98; joints of fore tarsi as 85-52-31-19-12; of middle tarsi as 100-40-32-18-10; joints of posterior pair as 108-37-48-40-9. Halteres yellow, the knobs appearing brown against a light background. Calypters pale yellow, their cilia and a narrow apical margin brownish.

Wings slightly tinged with yellow; third and fourth veins nearly parallel, fourth ending a little back of the apex of the wing; last section of fifth vein 32, cross vein twenty-one fiftieths of a millimeter long.

Female.—Almost like the male in color and form of wing; the face is narrow and ocher yellow; the fifth abdominal segment is similar to the fourth in color; ovipositor yellow with a black tip; joints of posterior tarsi as 50-58-40-18-10; cilia of the calypters more yellow than in the male.

Described from three males and two females taken by Nathan Banks at Barro Colorado Island, Panama Canal Zone; type, male, taken July 22; female, allotype, taken August 2, 1924, the paratypes were taken in June and July; also another female paratype was taken by C. M. Rouillard at La Providencia, Siquinala, Guatemala, this last is in the United States National Museum.

Type and *allotype* in the Museum of Comparative Zoölogy.

Paratype.—Female, Cat. No. 41045, U.S.N.M.

This is very much like *signifer* Aldrich, the male differs in the form of the hypopygium, both sexes differ in having the disk of the scutellum wholly bluish-green, except the margin, where the yellow of the lower surface extends over the edge a very little.

NEURIGONA MACULIPENNIS, new species

Male.—Length 4 mm. Eyes almost touching, leaving a narrow space above and below that is covered with grayish pollen; front

shining violet; antennæ yellow, small; palpi yellowish; lateral and inferior orbital cilia white.

Thorax and scutellum dark blue, the depressed space in front of the scutellum more bronze; lower surface of scutellum reddish; the minute hairs on the thorax and abdomen yellow; bristles of thorax black. Abdomen dark blue-green, the incisures narrowly blackish. Hypopygium (fig. 43) black, the small spatulate lamellae dark yellow.

Fore coxae yellow with short, stiff, black hairs; middle and hind coxae more brownish; femora and fore tibiae yellow; middle tibiae and tarsi yellowish with the extreme tips of tibiae and each tarsal joint brown; hind tibiae and tarsi brown; fore tarsi yellow with the last joint brown; joints of fore tarsi as 41-30-18-7-10; those of middle ones as 71-35-20-9-8; joints of posterior tarsi as 24-44-24-11-7.

Wings grayish, apical half with a dark cloud beginning a little before the cross vein and reaching from the costa to a little back of fourth vein and extending to fifth vein along each side of the cross vein; last section of fourth vein gently bent before the middle, then approaching third vein, reaching the wing margin before the apex of the wing; last section of fifth vein nearly twice as long as the cross vein.

Described from two males taken by August Busck February 2, 1911, at Paraiso, Panama Canal Zone.

Type.—Male, Cat. No. 41046, U.S.N.M.

Genus *THINOPHILUS* Wahlberg

Thinophilus WAHLBERG, Öfv. Kongl. vet. Akad. Förhandl., vol. 1, 1844, p. 37.—LOEW, Mon. North Amer. Diptera, pt. 2, 1864, p. 184.—WHEELER, Ent. News, vol. 7, 1896, p. 153; Proc. California Acad. Sci., vol. 2, 1899, p. 69.—VAN DUZEE, Annals Ent. Soc. Amer., vol. 19, 1926, p. 35, table of species.

THINOPHILUS PANAMENSIS, new species

Male.—Length, 2.7-3 mm. Face wide, dark green, almost black, with thin gray pollen; palpi yellow, darkened at base, cut off at apical end in a nearly straight line; antennae yellow, of the usual form; arista black; lower orbital cilia and beard white.

Thorax greenish black with slight coppery reflections, in well-preserved specimens covered with gray pollen, which gives it a mottled appearance. Abdomen very dark green with coppery reflections, nearly bare. Hypopygium (fig. 44) black, large, extending under the venter to the middle or even the base of third segment.

Coxae black, anterior pair with yellow tips and short white hair; femora, tibiae and tarsi yellow; tarsi not or scarcely darker at their tips; bristles of hind tibiae as long as the diameter of the tibia; three first joints of hind tarsi as 15-15-10. Halteres yellow.

Wings more or less tinged with yellow in front; veins usually brown, except at the root of the wing, sometimes they are yellow with the apical part brown; third and fourth veins nearly parallel beyond the cross vein, the third bending back a very little toward its tip, fourth ending in the apex of the wing; last section of fifth vein 21, cross vein fifteen-fiftieths of a millimeter long.

Female.—Almost like the male; joints of posterior tarsi as 19-22-12-8-10.

Described from six males and five females; the *type*, *allotype*, and seven *paratypes* were taken by A. H. Jennings, on the beach at Old Panama; the other two *paratypes* were taken by A. Busck, March 14, 1912, at Corozal, Panama Canal Zone, at lights.

This would run to *thalassinus* Van Duzee in the table of species in the Annals Entomological Society of America (vol. 19, p. 36, couplet 19), but it is smaller, the hypopygium much more conspicuous, its yellow appendage also being shorter and directed forward, not downward as in that species; this form has the palpi cut off more or less squarely at tip; the first and second joints of posterior tarsi are of equal length, in *thalassinus* the first joint of hind tarsi is much longer than the second.

Type.—Male, Cat. No. 41047, U.S.N.M.

Genus MEDETERA Fischer

Medetera FISCHER, Progr. contenant une notice sur une Mouche carnivore, 1819, p. 10.—LOEW, Mon. North Amer. Diptera, part 2, 1864, p. 218, table of species.—WHEELER, Proc. California Acad. Sci., vol. 2, p. 20, table of species.—ALDRICH, Trans. Entom. Soc. London, part 3, 1896, p. 337.—VAN DUZEE, Proc. California Acad. Sci., vol. 9, p. 257, table of species.

There are before me eight species of this genus, all taken in Guatemala except *bella*. All are bright but rather dark green, nearly 3 mm. long, have at least two pairs of femora black, the tibiae and tarsi yellow, the latter sometimes more or less blackened (in *bella* the tibiae and tarsi are black); all have two pairs of scutellar bristles. These form a very distinct group in the genus; they may be separated in the following table:

KEY TO NEOTROPICAL SPECIES OF MEDETERA

- | | |
|--|-------------------------------------|
| 1. All tarsi plain..... | 2. |
| Fore tarsi modified..... | 4. |
| 2. Legs and feet wholly black..... | <i>bella</i> , new species. |
| Tibiae and tarsi yellow, tarsi more or less darkened at tip..... | 3. |
| 3. Antennae black..... | <i>planipes</i> Van Duzee. |
| Antennae yellow..... | <i>pallidicornis</i> , new species. |
| 4. Fore and middle femora largely black, hind femora yellow..... | 5. |
| All femora largely black..... | 6. |

pale hair; hypopygium rather small, black, becoming yellowish on apical half; it has pale yellow lamellae (fig. 52) with two long hairs at tip and several curled and branched ones below.

Coxae and femora black; fore coxae with pale hair; tips of femora broadly yellow; tibiae and tarsi yellow, the tarsi scarcely darker at tip; fore tarsi (fig. 47) with the third joint (fig. 48) enlarged and with a thin, translucent plate on one side; this plate has long bent hairs on the edge of apical portion; joints of fore tarsi as 20-14-10-5-5; of middle ones as 27-10-7-8-5; joints of posterior pair as 13-27-17-7-6. The bristles of the tibiae appear yellow, at least in certain lights; halteres pale yellow.

Wings grayish, veins brown; last section of fifth vein 15, cross vein eleven-fiftieths of a millimeter long; venation normal.

Described from one male, taken by Nathan Banks, June 27, 1924, at Barro Colorado Island, Panama Canal Zone.

Type.—In the Museum of Comparative Zoölogy.

MEDETERA SCAURA, new species

Male.—Length, 3 mm. Face and front blue or violet, the latter green along the orbits; antennae black, third joint small, scarcely as long as wide, rounded, with an apical arista; lateral and inferior orbital cilia yellow.

Thorax and abdomen shining green, their hairs and bristles black, in one specimen the thorax and scutellum have violet reflections; lateral edges of the thorax with a narrow coppery streak; scutellum with two pair of bristles; propleurae with two short, black bristles above each fore coxa. Hypopygium pedunculate, black with yellow appendages.

Coxae and femora black; tips of femora, the tibiae and tarsi yellow, last one or two joints of the tarsi black; fore and middle coxae with pale hairs on anterior surface; fore femora with a few black bristles near the tip on lower posterior edge; posterior femora with two rather large bristles near the middle of anterior surface; hair on all femora black and conspicuous; fore tarsi (fig. 50) widened from the base to tip of third joint; last two joints very small, black, third joint rounded at tip; joints of fore tarsi as 24-15-15-3-5; those of middle ones as 32-18-14-6-7; joints of posterior pair as 17-31-22-10-8. Calypters, their cilia, and the halteres yellow.

Wings a little grayish, veins yellowish brown; last section of fifth vein 20, cross vein nineteen-fiftieths of a millimeter long; venation normal.

Described from five males taken by J. M. Aldrich; two were collected April 14 and 16, 1926, at La Providencia, Obispo, Guatemala; the other three at Coban, Alta Vera Paz, Guatemala, May 20, 1926.

Type.—Male, Cat. No. 41048, U.S.N.M.

MEDETERA PALLIDICORNIS, new species

Male.—Length, 2.5 mm. Face and front green; apical part of proboscis and the palpi yellow; antennae wholly yellow, third joint rounded; arista apical, yellow at base, more brown at tip; lower orbital cilia yellow.

Thorax and abdomen green; dorsum of thorax with brown pollen, which is visible when viewed from in front; propleurae with one black bristle above each fore coxa; scutellum with two pair of bristles; bristles of thorax black; hairs of abdomen pale, the bristles on the hind margins of the segments black. Hypopygium (fig. 51) blackish with yellow appendages, the outer lamellae rather long, curved with curled hairs, some of which are branched.

Coxae and basal half or more of femora black; apical part of femora, the whole of the tibiae and tarsi, together with their hairs and most of their bristles yellow; hairs of fore coxae yellow; tarsi plain; joints of fore tarsi as 27-14-10-5-5; those of middle pair as 30-14-10-3-4; joints of posterior tarsi as 18-30-17-8-6. Calypters, their cilia, and the halteres yellow.

Wings grayish, veins yellowish, costa brown; last section of fifth vein 22, cross vein twelve-fiftieths of a millimeter long.

Female.—About the same as the male; wings the same; joints of posterior tarsi about the same length as in the male.

Described from two pairs taken by J. M. Aldrich, April 16, 1926, at La Providencia, Obispo, Guatemala.

Type.—Male, Cat. No. 41049, U.S.N.M.

MEDETERA VARIPES, new species

Male.—Length 3 mm. Face, front and anterior part of thorax blue, sometimes the latter blue-green; antennae black, third joint small, rounded; arista apical; proboscis and palpi black; lower orbital cilia yellowish.

Posterior part of thorax and the abdomen green; dorsum of thorax with gray pollen, which is conspicuous when seen from in front; bristles of the thorax black, anterior part of thorax with minute yellow hairs; hairs of the abdomen yellow; bristles above fore coxae black; scutellum with two pair of bristles. Hypopygium black, its appendages yellow, among these is a slender yellow filament, fringed on one side with long hairs.

Coxae, basal half of fore femora and basal four-fifths of middle ones black; hairs of fore coxae yellow; apical part of fore and middle femora, whole of posterior femora, trochanters, all tibiae and tarsi yellow, tips of tarsi darkened; hairs of femora and tibiae yellow, except a few long black hairs on upper basal part of posterior femora; fore tarsi (fig. 46) with third joint enlarged on the side,

this enlargement being almost lobelike; first joint of hind tarsi with nine long spines below and one short one above; joints of fore tarsi as 28-13-12-5-5; of middle ones as 32-17-13-6-5; joints of posterior pair as 17-36-21-9-7. Calypters, their cilia and the halteres yellow.

Wings a little grayish, veins yellowish, costa brown; venation normal; last section of fifth vein 20, cross vein fourteen-fiftieths of a millimeter long.

Described from four males, taken by J. M. Aldrich, April 16, 1926, at La Providencia, Obispo, Guatamala.

Type.—Male, Cat. No. 41050, U.S.N.M.

This is very much like *minor* and *palestris* Becker, described from Paraguay and Peru, it differs from both in the color of the legs and feet, also more or less in the form of the fore tarsi.

MEDETERA FLAVISETA, new species

Male.—Length, 2 mm. Face dark green, almost black; antennae black, third joint conical in outline, pointed at tip, nearly twice as long as wide; ocular bristles yellow.

Thorax dark green, the depressed space on posterior slope coppery; bristles of thorax yellow (bristles of scutellum broken off); bristles above fore coxae whitish. Abdomen blackish green with coppery reflections, its hair pale. Hypopygium black, somewhat shining, with small yellow appendages.

Coxae black; fore and middle femora blackened at base, posterior pair almost wholly yellow; tibiae and tarsi yellow, tips of the tarsi black; joints of fore tarsi as 10-12-10-4-5; of middle ones as 19-19-12-9-4; joints of posterior pair as 8-24-14-9-6. Calypters, their cilia, and the halteres yellow.

Wings grayish; venation normal; last section of fifth vein 14, cross vein seven-fiftieths of a millimeter long.

Described from one male, taken by Nathan Banks, July 13, 1924, at Barro Colorado, Panama Canal Zone.

Type.—In the Museum of Comparative Zoölogy.

Genus THRYPTICUS Gerstaecker

Thrypticus GERSTAECKER, Stettin. Ent. Zeit., 1866, p. 43.—WHEELER, Psyche, vol. 5, 1890, p. 375 (*Aphantotimus*); Proc. California Acad. Sci., vol. 2, 1899, p. 30, table of species.—ALDRICH, Trans. Ent. Soc. London, 1896, p. 339 (*Xanthotricha*).—VAN DUZEE, Psyche, vol. 22, 1915, p. 84, table of species; Psyche, vol. 28, 1921, p. 124, table of species.

THRYPTICUS ACUTICAUDA, new species

Male.—Length 2 mm. Upper part of face and the front violet, lower part of face green; antennae dark yellow with the third joint black.

Thorax bright green, the depressed space before the scutellum coppery; abdomen blue-green; bristles of the thorax and the minute hairs on the abdomen yellow; the very small bristles on the hind margins of the abdominal segments and the bristles of the head black. Hypopygium (fig. 53) black with purple reflections, truncate at tip, its lamellae pale yellow, brown at tip, large and with the tip drawn out into a point, there are three or four long hairs on upper edge.

All coxae brown with yellow tips; femora, tibiae and tarsi pale yellow, tarsi scarcely darker at tip; joints of middle tarsi as 20-11-7-5-4; of posterior pair as 12-17-10-6-6.

Wings a little grayish, veins yellowish brown; fourth vein only slightly bent back at the cross vein, ending in the apex of the wing; fifth vein nearly straight; cross vein 8, last section of fifth vein twenty-five fiftieths of a millimeter long.

Described from one male, taken by J. M. Aldrich, May 1, 1926, at El Salto, Antigua, Guatemala.

Type.—Cat. No. 41051, U.S.N.M.

This differs from *amoenus* Becker (Bolivia) in having the hypopygial lamellae pointed at tip with several long hairs below, in *amoenus* they are also pointed, but with a long filament at tip. From *pusillus* Aldrich it differs in having all coxae blackened and in not having any inner appendages visible.

OEDEMATOPUS, new genus

This belongs to the *Hydrophorinae*. It differs from *Liancalus* in having no long bristles near the posterior margin of the abdominal segments and also in having the fore femora a little thickened at base, as in *Scellus* and *Hydrophorus*. It differs from the last two genera in having only fine hairs on lower surface of fore femora in both sexes. It differs from all three genera in having the posterior cross vein and last section of fourth vein nearly in the same line and both nearly parallel with the posterior margin of the wing.

The face is wide, reaching to or a little below the lower margin of the eyes; first antennal joint bare above; arista dorsal, nearly bare; palpi large in both sexes; proboscis large; one pair of ocellar bristles. No acrostichal bristles; dorsocentrals reduced to small hairs before the suture; scutellum with one pair of large marginal bristles, which are convergent; there are two bristles of considerable size above the root of the wing. Abdomen and the hypopygium of the male formed about as in the genus *Hydrophorus*; femora and tibiae without bristles in the male, with a few small ones in the female; base of the fore femora a little enlarged; first joint of hind tarsi a little longer than second. Last section of fifth vein very short, cross vein long, nearly six times as long as last section of fifth vein; sixth vein present.

In Doctor Aldrich's table of genera in Williston's Manual of North American Diptera this would run to *Plagioneurus*; in that genus the cross vein is far from the wing margin, the dorsocentral and post-ocular bristles are large, in this all these bristles are wanting in both sexes, except the hairlike dorsocentrals.

The name is suggested by the thickened posterior legs of the male.

Type of genus.—*Oedematopus crassitibia*, new species.

OEDEMATOPUS CRASSITIBIA, new species

Male.—Length 4.5 mm.; of wing 6 mm. Face, front, and palpi covered with silvery white pollen; front about one-fourth as long as the face, rather narrow, being about as wide as the lower part of the face; face a little narrowed above, but wide even at the antennae, the ridge separating the upper and lower portions of the face distinct and a very little below the middle, lower part nearly round, the lower edge evenly rounded and reaching slightly below the lower corner of the eyes; palpi large, longer than wide, almost pointed at tip, the inner edge almost straight, outer rounded, the black ground color showing through the white pollen a little, there are small black hairs near the tip, lying close against the large, black proboscis; antennae rather small, first joint bare above, second with short bristles, third rounded, about as long as wide; arista bare, dorsal, more than twice as long as the antennae; occiput blue with green reflections above, dulled with white pollen; about six black orbital bristles on upper orbits; beard scattering, yellowish; no postvertical bristles; one pair of short, straight ocular bristles.

Thorax green, not shining, even the posterior part dull, the anterior portion and most of the dorsum appear velvety blackish brown when viewed obliquely; the sides above the pleurae, from the root of the wing, extending upward at the suture and including the humeri are blue and thickly covered with white pollen; on each side above and inside of the humeri, but quite widely separated from them, is a long silvery-white pollinose spot, which is nearly round, from the inner side of which is a narrower white pollinose stripe extending back parallel with the middle of the dorsum; the pollen forming this stripe is white but not silvery and fades out posteriorly near the middle of the dorsum; pleurae green with white pollen; scutellum blue with a pair of moderately long slender bristles; metanotum blue with white pollen; one short humeral bristle; no acrostichal bristles; several small slender hairs represent the dorsocentral bristles; there are two longer bristles on each side above and back of the root of the wing. Abdomen (fig. 77) formed about as in *Hydrophorus*, short and thick, without bristles and covered on the side with white pollen; it is black with green and blue reflections, sometimes quite bright on upper surface and sometimes almost wholly dull black. The hypopy-

gium is moderately large with small, blackish lamellae, which are narrow with nearly parallel sides and blunt tip; hairs of abdomen black, short, with a few pale ones mixed with them.

Fore coxae and all femora green, dulled with white pollen, the former with long yellowish hair; all trochanters yellow; fore and middle femora moderately but distinctly thickened at base, the former with slender yellowish hairs below; middle femora with a row of minute black spines below, at base double; hind femora a very little compressed with a close set row of black spines or short bristles below (fig. 78); fore and middle tibiae blackish, the former without bristles but with yellow tomentum below; posterior tibiae black with brown pollen and pale brown very short hair (fig. 78), greatly inflated, almost as thick as wide, evenly rounded from base to tip, widest near the middle. All tarsi blackish, the posterior pair have a peculiar stiff tapering appearance, as in figure 78; length of posterior femora as 120, width as 17; length of their tibia as 190, width near the middle as 47; joints of fore tarsi as 57-16-10-8-18; of middle ones as 77-21-10-7-15; joints of posterior ones as 46-34-19-11-17. Calypters whitish with brown edge and yellowish cilia; halteres yellow.

Wings dark grayish; more than three times as long as wide; first vein not quite reaching the middle of the wing; second and third veins nearly parallel, but slightly divergent to their tips; last section of fourth vein slightly bisinuous, nearly parallel with the wing margin, and in approximately the same line as the cross vein; its tip not far back of the tip of third vein; apex of wing at tip of third vein, or perhaps between the tips of third and fourth veins, the wings being a little widened at tip; cross vein parallel with the hind margin of the wing; last section of fifth vein very short; cross vein 74, last section of fifth vein if continued to wing margin would be 13 and last section of fourth vein about ninety-five fiftieths of a millimeter long; sixth vein strong, tapering, not reaching the wing margin.

Female.—Thorax about as in the male, the scutellum green with brownish pollen. Face and front wide, very much as in *Pelastoneurus*; upper part of face velvety brown, below the suture brown in the middle, broadly whitish pollinose along the orbits and on lower edge, it extends down nearly or quite as far as in the male; front yellowish-brown pollinose; ocular bristles short and straight as in the male; palpi about as in the male in form and size, mostly velvety brown; hind femora bent, without spines below; fore and middle femora scarcely enlarged at base; without spines or long hair below. Abdomen depressed, blue with purple and green reflections, its hairs as in the male, except that there is a cluster of long black hairs on each side of first segment and long yellowish hairs on posterior mar-

gin of fifth ventral segment. Posterior tibiae and tarsi normal, of about equal length, first joint of hind tarsi about as long as the following two joints taken together. Calypters, their cilia, the antennae, and wings about as in the male.

Described from five males and four females, all taken by J. M. Aldrich, May 1, 1926, at El Salto, Antigua, Guatemala.

Type.—Male, Cat. No. 41052, U.S.N.M.

The wing venation is almost the same as that of *Liancalus vidua* Becker, and figured by him,² and described from a female taken in Peru. These probably belong to the same genus, but *vidua* Becker has black cilia on the calypters and also differs in other characters.

Genus PARACLIUS Loew

Paraclius LOEW, Mon. North Amer. Diptera, pt. 2, 1864, p. 97.—WHEELER. Proc. California Acad. Sci., vol. 2, 1899, p. 18, table of species.—ALDRICH, Biologia, Diptera, vol. 1, 1902, p. 337, table of Mexican species; Kansas Univ. Sci. Bull., vol. 1, 1900, p. 47, table of species; Trans. Amer. Ent. Soc., vol. 30, 1904, p. 272, combined table of species of *Pelastoneurus*, *Paraclius*, and *Sarcionus*.—? *Paracleius* BIGOT, Annales Soc. Entom. France, 1859, p. 215.

PARACLIUS VENUSTUS Aldrich

Paraclius venustus ALDRICH, Biologia, Diptera, vol. 1, 1902, p. 340.

Paraclius ovatus VAN DUZEE, Ent. News, vol. 25, 1914, p. 436.

Seventeen males and females were taken by J. M. Aldrich; six of them, April 14 and 16, at La Providencia, Guatemala; the rest, May 7, at Quirigua, Guatemala.

PARACLIUS NIGRIPES Aldrich

Paraclius nigripes ALDRICH, Kansas Univ. Sci. Bull., vol. 1, 1902, p. 78.

J. M. Aldrich took one male, May 25, 1926, at head of Polochic River, Alta Vera Paz, Guatemala; C. T. Greene took five, April 16 and 26, at Barro Colorado Island, Panama Canal Zone.

PARACLIUS ALBONOTATUS Loew

Paraclius albonotatus LOEW, Mon. of North Amer. Diptera, pt. 2, 1864, p. 102.

C. T. Greene took two females at Barro Colorado Island, Panama Canal Zone, April 17, 1926.

PARACLIUS ARCUATUS Loew

Paraclius arcuatus LOEW, Neue Beitr., No. 8, 1861, p. 39; Mon. North Amer. Dipt., vol. 2, 1864, p. 101.

One female, taken by J. M. Aldrich, at Ingenio Railroad Station, west of Guatemala City, April 28, 1926.

² American Dolichopodidae, 1921, p. 119, fig. 47.

PARACLIUS species

Six females were taken by J. M. Aldrich in Guatemala; these probably represent three species, but I have not been able to determine them.

PARACLIUS ANGUSTIPENNIS, new species

Female.—Length 2 mm. Face narrow, white; front dull with brownish pollen; antennae wholly black, third joint small, somewhat rounded, irregular on apical margin; arista short, pubescent; lateral and inferior orbital cilia white.

Thorax and abdomen green, quite shining. Coxae, femora, posterior tibiae and all tarsi wholly black; trochanters and fore and middle tibiae yellow; all femora with a row of black hairs below, which are longer than the hairs on upper edge; joints of fore tarsi as 18-9-7-5-6; of middle ones as 29-20-17-12-9; joints of posterior tarsi as 22-31-20-7-8. Calypters and halteres yellow, the former with black cilia.

Wings uniformly tinged with brown, rather narrow; third vein straight; last section of fourth vein with a broad, gradual bend near its middle, arched beyond this bend so as to approach third vein and run parallel with it for a short distance at tip, reaching the wing margin a considerable distance before the apex of the wing; last section of fifth vein 23, cross vein seven-fiftieths of a millimeter long.

Described from one female taken by J. M. Aldrich, April 14, 1926, at La Providencia, Obispo, Guatemala.

Type.—Female, Cat. No. 41053, U.S.N.M.

PARACLIUS ALBITALUS, new species

Male.—Length 3.6 mm. Face silvery white, narrow above, wider below, the portion below the suture almost round and a little concave; front shining blue or violet; antennae yellow, third joint brown at tip, nearly round with a small point at tip; lateral and inferior cilia and the bristles below the head yellowish, a few of the upper cilia black.

Dorsum of thorax green with blue or violet reflections and brown pollen when viewed from in front; pleurae more black with white pollen; there is no velvety black spot above the root of the wing. Abdomen green, upper part of dorsum more blue, the spots of white pollen on the sides of the segments conspicuous. Hypopygium and its lamellae black, the latter yellow at base, with apical part rounded, tapering abruptly at base into a yellow petiole, fringed with pale hairs.

Coxae black with extreme tips and the trochanters yellow; anterior coxae with black hair; all femora blue with extreme base and tips

yellow; fore tibiae yellow on outer surface, white on upper and inner sides, the upper surface broad, flattened or a little concave, glabrous, on each edge with a row of close set, short, black hairs; inner surface also somewhat flattened and mostly glabrous on apical half or more; middle and hind tibiae yellow, the latter a little blackened at tip. Fore tarsi with the first joint white, sharply black at tip, its hairs black; middle tarsi black from the tip of the first joint, yellow at base; posterior tarsi mostly black. Joints of fore tarsi as 26-8-7-5-7; of middle ones as 42-20-14-10-10; joints of posterior pair as 32-33-17-14-10. Calypters, their cilia and the halteres yellow.

Wings grayish; costa without enlargement; last section of fourth vein abruptly bent near the middle, beyond the bend conspicuously arched, apical fourth nearly parallel with third vein, which is a very little bent back toward its tip; last section of fifth vein 20, cross vein twenty-two fiftieths of a millimeter long; fourth vein ending in the wing margin a little before the apex of the wing.

Described from one male, taken by Nathan Banks, July 26, 1924, at Barro Colorado Island, Panama Canal Zone.

Type.—In the Museum of Comparative Zoölogy.

PARACLIUS SIMPLEX, new species

Male.—Length 3.6 mm. Face silvery white, narrow below, wider above, reaching slightly below the eyes; front shining blue; antennae yellow with upper edge black, third joint nearly round in outline; lateral and inferior orbital cilia whitish.

Thorax green, dorsum with blue reflections, pleurae with white pollen. Abdomen green, more or less of posterior part of segments purple, sixth segment extending a little over the hypopygium, small, yellow with a black tip. Hypopygium greenish black, large and closely applied to the venter, with two spots of white pollen at base; its lamellae yellow, of moderate size and as near as I can see of a circular shape.

Fore coxae wholly yellow with black hair and bristles; middle and hind coxae largely black; femora and tibiae yellow, extreme tips of posterior pair a little brown; tarsi black from the tip of the first joint, hind tarsi with the black extending nearly to the base on one side and with a long bristle at base below. Joints of fore tarsi as 30-10-7-6-6; those of middle ones as 44-26-18-10-10; first two joints of posterior pair as 35-39. Calypters and halteres yellow, the former with black cilia.

Wings uniformly tinged with brown; costa without an enlargement; third vein a little bent back at tip; last section of fourth vein bent a little before its middle, conspicuously arched beyond the

bend, then gradually approaching third at tip, reaching the wing margin a little before the apex of the wing.

Described from one male, taken by Nathan Banks, July 26, 1924, at Barro Colorado Island, Panama Canal Zone.

Type.—In the Museum of Comparative Zoölogy.

PARACLIUS PARVICAUDA, new species

Male.—Length 3 mm. Face and front silvery white; face narrow, a little wider below, suture near apical fourth, lower portion a little longer than wide, almost pointed at tip; antennae wholly black, third joint nearly round; arista pubescent; palpi black; lateral and inferior orbital cilia yellowish white.

Thorax dark green; pleurae with silvery white pollen; the velvety black stripe above the root of the wing is not conspicuous, the white spot at the suture large, but the white does not quite conceal the ground color, it extends as a curved line over the humeri. Abdomen green with white pollen; hypopygium very small, black, scarcely reaching beyond the venter of the fifth segment, tapering toward its tip; lamellae not very small, black, rounded at tip, a little longer than wide.

All coxae and femora black; trochanters yellowish; fore tibiae rather thick, yellow, the upper edge with silvery white pollen; middle tibiae yellow with posterior surface more brown; hind tibiae yellow with apical third black; middle tibiae with two large bristles below and a small one between them; fore tarsi sharply black from the tip of the first joint, middle and hind ones wholly black; joints of fore tarsi as 30-11-9-7-10; of middle ones as 43-23-17-9-9; those of posterior pair as 31-35-22-12-10. Calypters and halteres yellow, cilia of the former black.

Wings dark grayish; costa not thickened; third vein nearly straight; last section of fourth vein abruptly bent a little before its middle, nearly parallel with third for some distance before their tips, fourth reaching the wing margin before the apex of the wing; cross vein and last section of fifth vein each twenty-one fiftieths of a millimeter long; hind margin of wing notched at tip of fifth vein.

Female.—Almost like the male in form and color of head, thorax, abdomen, legs, and feet, except that the fore tibiae are not so silvery on upper surface and middle tibiae are mostly yellow, not being so brown on posterior surface.

Described from one pair taken by C. M. Rouillard at La Providencia, Siquinala, Guatemala.

Type.—Male, Cat. No. 41054, U.S.N.M.

PARACLIUS ALDRICHI, new species

Male.—Length 4 mm. Face golden yellow, reaching the lower margin of the eyes, narrow in the middle, wider below, the portion below the suture a little longer than wide, lower edge rounded; palpi and proboscis black with minute pale hairs; antennae yellow with a black spot at base of arista, third joint somewhat conical, slightly longer than wide; front blue-green with yellowish pollen; orbital cilia wholly black.

Thorax blue-green, anterior part of dorsum covered with yellowish-brown pollen, posterior part shining; pleurae with silvery white pollen; the pollen at the transverse suture is yellowish white, above the root of the wing there is a nearly round spot of white pollen. Abdomen dark green, posterior margins of segments more blue-black, segments with large spots of white pollen on their sides. Hypopygium and its lamellae black, petiole of the latter yellow at base; lamellae formed about as in *subpubescens* Becker, they are broader than long, somewhat rectangular in outline with the basal corner rounded, with delicate pale hairs and a few stouter black bristles near the tip; inner appendages small, pale yellow.

The whole of fore coxae, tips of middle ones, most of posterior coxae, and all femora and tibiae yellow; fore coxae with small black hair on anterior surface and several bristles on apical half of outer edge; fore tibiae formed about as in *fusiformis* Becker (fig. 57), but more narrowed at base, flattened and much widened on apical two-thirds, upper surface glabrous and silvery white, this glabrous area extends to the base but becomes more yellow and very narrow. The tibiae have a bristle on each edge near the middle; the anterior surface is also a little flattened, glabrous and white pollinose on apical two-thirds; middle tibiae with two large bristles below, posterior pair black at tip on inner surface; fore tarsi with most of first joint yellow; middle and hind tarsi blackish, more or less yellow at base; length of fore tibiae as 67, width at widest part, which is near apical third, as 16; joints of fore tarsi as 40-13-10-7-9; joints of middle tarsi as 49-27-21-13-11; those of posterior ones as 42-43-27-17-14. Calypters and halteres yellow, cilia of the former black.

Wings tinged with brownish gray; third vein nearly straight; last section of fourth vein sharply bent near its middle, then arched so that its apical fourth runs parallel with third vein, its tip before the apex of the wing; cross vein 28, last section of fifth vein twenty-four fiftieths of a millimeter long.

Female.—Wings and general color about as in the male; antennae black on the upper half; face a little wider than in the male, whitish, strongly tinged with yellow, sometimes almost brownish yellow; color

of legs and feet as in the male, fore tibiae normal, yellow; joints of tarsi about as in the male; the spot of pollen at the transverse suture is more white than in the male, the spot of white pollen above the root of the wing is conspicuous.

Described from five males and three females, taken by J. M. Aldrich, May 25, 1926, at Tamau, Alta Vera Paz, Guatamala.

Type.—Male, Cat. No. 41055, U.S.N.M.

PARACLIUS LATITIBIA, new species

Male.—Length 3.6 mm. Face reaching lower border of the eyes, golden yellow, narrow above, wider below, portion below the suture nearly round, but obtusely pointed on the lower margin. Antennae yellow, third joint a little longer than wide, rounded and brown at tip; arista nearly bare; orbital cilia wholly black.

Dorsum of thorax shining green, dulled with brown pollen when viewed from in front, the space between the humeri and root of wings covered with silvery white pollen; pleurae with silvery pollen. Abdomen blackish with green and purple reflections; sides of segments with large spots of silvery white pollen, the ground color of these spots green. Hypopygium yellow, black at base, the lamellae yellow, fringed with pale hairs and with a few black bristles at base.

Fore coxae yellowish brown with black hairs and bristles, middle ones black with a yellow tip, posterior pair black at base, yellow on apical half or more; femora and tibiae wholly yellow; fore tibiae (fig. 55) greatly flattened, elongate oval, 65 long to 23 wide, upper surface wholly glabrous, covered with silvery white pollen, the hairs on anterior edge and at tip white, the other hairs and the bristles black, lower surface with a glabrous space, which extends the whole width at tip and runs obliquely to the middle of anterior edge; fore tarsi white, more yellow toward their tips; middle and hind tarsi black from the tip of the first joint; posterior basitarsus with a large bristle below. Joints of fore tarsi as 30-11-9-6-6; of middle ones as 50-27-19-10-7; joints of posterior tarsi as 34-39-24-13-11. Calypters and their cilia black; halteres yellow.

Wings dark gray; costa without an enlargement; third vein nearly straight, last section of fourth vein abruptly bent before its middle, much arched beyond the bend, parallel with third vein for about two-thirds the distance beyond the bend in fourth, reaching the wing margin a little before the apex of the wing; last section of fifth vein 21, cross vein twenty-three fiftieths of a millimeter long.

Female.—The female (as I have associated the sexes) has the face silvery white; the upper edge of the fore tibiae is distinctly flattened, but not widened, the flattened stripe is glabrous and silvery white; fore tarsi mostly yellow. Otherwise about as in the male.

Described from three males and three females, taken by J. M. Aldrich, May 25, 1926, at Tamau, Alta Vera Paz, Guatemala.

Type.—Male, Cat. No. 41056, U.S.N.M.

This is closely related to *fusiformis* Becker, described from Peru.³ It differs from that species in having the fore tibiae broader and not narrowed at base as in that species; fore tarsi whiter; third antennal joint longer and the face golden yellow. *Paraclius aldrichi*, new species, is even more like *fusiformis*, as the fore tibiae are formed just as in that species, but differs from it in having the face golden yellow and in having the hypopygium and its lamellae wholly black, except the petioles of the lamellae which are yellow. It differs from *latitibia* in having the fore tibiae narrowed at base (about as in fig. 57) and in the hypopygium and their lamellae being black.

PARACLIUS FUSIFORMIS Becker

Paraclius fusiformis BECKER, Abh. Zool.-Bot. Ges. Wien, vol. 13, 1921, p. 49.

Third antennal joint nearly round in outline, not longer than wide; the lamellae of the hypopygium (fig. 56) are fringed with pale hairs and have black bristles at base; the face is silvery white when viewed from above, velvety brown when seen from in front; the fore tibiae (fig. 57) are 65 long to 16 wide at the widest part, the basal part for a short distance is of nearly the usual form, the upper surface glabrous and silvery white, the lower surface does not have the glabrous space found in *latitibia* described above; the orbital cilia are wholly black, as are also the calypters and their cilia; the hind tarsi have a large bristle below near the base of first joint, but it is not erect; joints of fore tarsi as 34-14-11-10-7; those of middle ones as 59-25-15-9-8; joints of posterior ones as 49-45-27-15-11; hypopygium largely yellow, black at base, its lamellae pale yellow; wings about like those of *latitibia*, and like those figured by Becker in his description (p. 50, fig. 4).

The above description and the drawings were made from two males taken by Nathan Banks July 15 and 18, 1924, at Barro Colorado Island, Panama Canal Zone.

PARACLIUS ALBIMANUS, new species

Male.—Length, 2.6 mm. Face silvery white, rather wide, a little narrower below; front blue-green; antennae yellow, third joint mostly brown, not longer than wide, rounded at tip; arista with long pubescence, almost plumose; lateral and inferior orbital cilia white.

Thorax green with brown pollen, which is visible when viewed from in front. Abdomen green with bronze reflections and spots of

³ American Dollehopodidae, 1921, p. 49.

white pollen on the sides of the segments; hypopygium of moderate size, its lamellae oval, yellowish white, with a very narrow brown border and pale hairs.

Coxae, femora, and tibiae yellow; fore coxae with small black hairs; fore tarsi with the first joint wholly brown, last three white, in some lights more yellowish white, last joint a little darkened at tip, third and fourth joints with white hair; middle and hind tarsi dark brown; middle basitarsi with a row of little bristles below, which have their tips bent; posterior basitarsi with one or two bristles below near the base and one above at tip; fore basitarsi with bristles below, some of which are considerably longer than the diameter of the joint; joints of fore tarsi as 24-11-8-6-6; of middle ones as 31-19-16-11-8; joints of posterior pair as 26-35-25-18-8. Calypters and halteres yellow, the former with black cilia.

Wings grayish, a little darker in front; costa not thickened; third vein nearly straight, only slightly bent backward at tip; last section of fourth vein bent just before basal third; beyond this bend it is slightly arched, but nearly straight, approaching third to wing margin, which it reaches distinctly before the apex of the wing.

Described from two males; one, the *type* taken by P. P. Calvert March 4, 1910, at Cachi, Costa Rica, near Rio Reventazon, at 3,450 feet elevation; the *paratype* was taken by J. M. Aldrich May 1, 1926, at Quirigua, Guatemala.

Type.—Male, Cat. No. 41057, U.S.N.M.

This is very much like *venustus* Aldrich, but differs in having the fore tarsi and their hairs partly white.

PARACLIUS ARGENTIMANUS, new species

Male.—Length 4 mm. Face narrow, wider below, brown when seen from in front, yellowish when viewed from above; palpi and proboscis brown; front green, covered with silvery white pollen when seen from the right angle; antennae black, third joint yellowish brown, scarcely as long as wide, cut off nearly straight at tip, arista inserted at upper corner, pubescent; lower orbital cilia white.

Thorax green, dorsum with reddish coppery reflections; pleurae and coxae covered with silvery white pollen and a curved line of the same below the humeri; a large spot of white pollen at the suture, which appears bluish in certain lights, and a small spot of white pollen on each side of the scutellum; abdominal segments blackish at extreme base, then coppery, shading into bronze with the posterior margins bluish; sides of the segments with large spots of white pollen. Hypopygium brownish black, large, not petiolate; its lamellae nearly round, moderately large, black, their hairs pale and their petioles yellowish; inner appendages bristlelike, one pair arising from small

tubercles; the central organ black, inserted at base of hypopygium and equaling it in length.

All coxae black with yellow tips and black hairs and bristles; all femora, tibiae and the fore tarsi yellow, middle and hind tarsi brown or black; posterior femora black on whole upper edge; upper edge of fore tibiae flattened but not widened, silvery white, glabrous, with two small bristles on anterior edge and three or four on posterior edge, anterior surface with a narrow streak of silvery pollen on apical half, posterior surface with one bristle on lower edge; middle tibiae with two large bristles on lower anterior surface and upper surface with two rows of large bristles and a silvery pollinose streak between them; posterior tibiae without a bristle below. Fore tarsi distinctly compressed, first joint widest, sides of all joints glabrous and silvery pollinose; first joint of hind tarsi with a stout, but not large or erect, bristle below near the base; joints of fore tarsi as 35-15-12-7-10; of middle ones as 50-27-22-11-10; joints of hind tarsi as 37-42-28-15-11. Calypters and halteres yellow, cilia of the former black.

Wings slightly tinged with brown, posterior margin gray; costa much thickened from the base of the wing, this thickening is a little narrowed before the tip of first vein, where it is again increased and from there tapering to its tip; third vein nearly straight; last section of fourth vein bent almost at a right angle beyond its middle, then arched so as to run quite close to and parallel with third vein for half the distance from the bend to the wing margin, which it reaches far before the apex of the wing; hind margin of wing distinctly indented at tip of fifth vein; cross vein 24, last section of fifth vein eighteen-fiftieths of a millimeter long.

Described from one male taken by J. M. Aldrich, April 16, 1926, at La Providencia, Obispo, Guatemala.

Type.—Male, Cat. No. 41058, U.S.N.M.

This is a very distinct species and can be recognized at once by the enlargement of the costa from the root of the wing, the compressed and silvery fore tarsi, black upper edge of posterior femora, and the black hypopygial lamellae.

PARACLIUS FRONTALIS, new species

Male.—Length 3.2 mm. Face silvery white, long, nearly reaching the lower margin of the eyes, narrow in the middle of upper portion, the part below the transverse ridge about as wide as long, rounded below; palpi and proboscis dark yellow; front bright shining green in the middle, the sides with thick white pollen; antennae yellow, third joint black at tip, about as long as wide, slightly rounded at tip, arista with very short pubescence; lower orbital cilia white.

Thorax dark blue-green, quite shining, but covered with brown pollen when seen obliquely; a narrow line of whitish pollen curves over the humeri, a large spot of silvery white pollen at the suture and a minute dot above the lateral corners of the scutellum. Abdomen black with metallic reflections. Hypopygium large, black, sessile, its lamellae moderately large, yellow with short yellow hair, nearly round, but a little pointed at tip.

Fore coxae yellow with very short black hair; middle coxae largely blackish, hind ones yellow, considerably blackened at base; femora and tibiae yellow; all femora with very short hair, no longer ones below; fore tibiae with one bristle on lower posterior edge; middle tibiae with two large bristles on lower anterior edge and one on lower posterior surface; all tarsi plain, blackened from the tip of the first joint; joints of fore tarsi as 39-13-9-8-10; of middle ones as 52-28-20-12-12; those of posterior pair as 41-42-29-12-12. Calypsters and halteres yellow, cilia of the former black. Posterior basitarsi with a large but not erect bristle below near the base.

Wings slightly tinged with brown, gray on posterior margin; third vein slightly bent back at tip; last section of fourth vein bent just beyond its middle, then arched so as to be nearly parallel with third vein at tip, reaching the wing margin before the apex of the wing; cross vein 23, last section of fifth vein twenty-one fiftieths of a millimeter long; hind margin of wing scarcely indented at tip of fifth vein.

Described from one male taken by J. M. Aldrich at Tamau, Alta Vera Paz, Guatemala.

Type.—Male, Cat. No. 41059, U.S.N.M.

PARACLIUS TERMINALIS, new species

Male.—Length, 3 mm. Face rather wide, narrowed below, silvery white; front green; antennae yellow, third joint small, black at tip, not as long as wide; arista black, pubescent; lateral and inferior orbital cilia white.

Thorax and abdomen green with bronze reflections. Hypopygium small, black, yellow at tip; its lamellae white with a very narrow black border, oval, but not much longer than wide, with minute white hair.

All coxae, femora and tibiae yellow, tips of posterior tibiae blackened a little, middle ones also a little darkened at tip; hairs of fore coxae black; fore tarsi mostly yellow; middle tarsi (fig. 58) with first two joints reddish yellow, third and fourth black, fifth snow-white with white hair, last three joints a little flattened and widened, with long dense hair; hind tarsi wholly black; joints of fore tarsi as 30-12-9-6-6; of middle ones as 39-22-18-15-10; first four

joints of posterior pair as 31-38-27-19. Calypters and halteres yellow, the former with black cilia.

Wings gray; costa without thickening; third vein bent back at tip; last section of fourth vein bent before its middle, gently arched so as to approach third at tip, not or scarcely parallel with third at tip, reaching the wing margin just before the apex of the wing; last section of fifth vein 18, cross vein sixteen-fiftieths of a millimeter long.

Described from one male taken by J. M. Aldrich, May, 1926, at Antigua, Guatemala.

Type.—Male, Cat. No. 41060, U.S.N.M.

This is very much like *venustus* Aldrich in size, color, and form of hypopygial lamellae, but differs in having the middle tarsi ornamented.

PARACLIUS ACUTICORNIS, new species

Male.—Length, 3 mm. Face wide above, narrow below, covered with white pollen; palpi yellowish brown; antennae (fig. 59) yellow, the point and arista brownish, basal part of third joint nearly square with a long slender point extending from the middle, this is nearly as long as the basal portion; arista with long pubescence; front blue-green, almost without pollen; lateral and inferior orbital cilia whitish.

Dorsum of thorax blue with violet reflections and a little gray pollen; humeri a little yellowish; the velvety black stripe above the root of the wing distinct and reaching the suture, in front of which is a white pollinose spot, which reaches the humeri. Abdomen bright green with black hair and spots of white pollen on the sides of the segments; hypopygium yellowish brown; lamellae yellow at base, more brown apically, of moderate size.

Coxae, femora, tibiae, and fore tarsi wholly yellow, with short but very conspicuous black hair; middle and hind tarsi brown from the tip of the first joint; first joint of all tarsi have little spines below; joints of fore tarsi as 33-10-6-6-6; of middle pair as 44-24-19-13-8; joints of posterior tarsi as 26-41-23-14-8. Calypters, their cilia and the halteres yellow.

Wings grayish; first section of costa not at all thickened; last section of fourth vein with an abrupt curve forward near its middle, then arched so that its tip is near the tip of third vein and only a little in front of the apex of the wing; third vein only a very little bent backward at tip; last section of fifth vein 22, cross vein twenty-one fiftieths of a millimeter long.

Female.—Face about as wide as in the male, mostly green; antennae (fig. 60) smaller, the point at tip more obtuse and placed near lower corner; thorax blue-green, shining, humeri more yellow;

coxae, legs, and feet colored as in the male; cilia of the calypters black; venation about as in the male.

Type.—Male, taken by W. A. Kellerman, in Guatemala; *allotype*, female, taken by Nathan Banks, July 15, 1924, at Barro Colorado Island, Panama Canal Zone; both the above in the Museum of Comparative Zoölogy. A *paratype* in the United States National Museum was taken by C. M. Rouillard, at La Providencia, Siquinala, Guatemala.

Paratype.—Male, Cat. No. 41061, U.S.N.M.

Genus POLYMEDON Osten Sacken

Polymedon OSTEN SACKEN, Bull. U. S. Geological and Geographical Survey of the Territories, vol. 3, 1877, p. 317.—ALDRICH, Trans. Ent. Soc. London, 1896, p. 318; Biologia, Diptera, vol. 1, 1902, p. 333, tables of species.—VAN DUZEE, Annals Ent. Soc. Amer., vol. 20, 1927, p. 123, table of species.

POLYMEDON TRANSVERSUS, new species

Male.—Length 6 mm.; of wing the same. Face wide, flat, extending as far below the eyes as its width at half its length, where it is slightly narrowed; it is of a dark-bronze color down to above the lower margin of the eyes, where this color abruptly ends, the lower part being yellow and having a sharp median carina, the lateral edges also projecting forward so as to leave two broad, flat longitudinal depressions, the yellow portion tapering downward, but cut off straight at tip, not at all pointed; the pollen of the upper portion is arranged in transverse waves. Palpi large, somewhat round, yellow, covered with white pollen, with a stout black spine at the middle of lower edge and several delicate hairs. Front shining violet, this color extending over the vertex in the middle; occiput green with white pollen. Antennae black, lower edge of all joints a little yellowish, first joint hairy above, about one and a half times as long as wide, third joint rounded with the arista inserted above near the apex. About six of the upper orbital cilia on each side black, the lower cilia and the beard yellowish white and long.

Thorax blackish with purple reflections, its pollen gray, mostly confined to the anterior edge; acrostichal bristles and presutural dorsocentrals small, the former in two rows; pleurae and coxae covered with silvery white pollen. Abdomen green with black hair, white pollen on the sides abundant. Hypopygium (fig. 61) short and stout, greenish, its outer lamellae large, yellow, nearly round with short delicate yellow hair; there are also a pair of slender inner appendages and a pair of thin, somewhat triangular, shining black lateral appendages projecting downward; the central organ is rather stout, curved, reddish yellow, its sheath black, attached at the base of the hypopygium and scarcely reaching the tip.

Fore coxae yellow with two black bristles near the tip; middle and hind coxae black with a large black bristle on outer surface, that on middle ones near the base; femora and tibiae yellow; tarsi black, a little yellowish at base; fore femora with two long bristles below near the base and several small ones around them; joints of fore tarsi as 50-29-25-16-15; of middle ones as 85-47-34-16-18; joints of hind tarsi as 64-93-40-17-17. Calypters and halteres yellow, the former with black cilia, these cilia not long or dense as in some species. Pulvilli of fore tarsi very small, those on middle and hind tarsi wholly wanting; claws long and slender.

Wings long and narrow, gray, more brownish in front; costa with an enlargement at tip of first vein, which fills the costal cell at tip, widening at proximal end so as to touch second vein at one point, but this enlargement is only about twice as long as wide at its widest part, the side toward second vein rounded; last section of fourth vein quite abruptly bent just before its middle, parallel with third at tip, reaching the wing margin just before the apex of the wing; the cross vein less than its length from the wing margin measured on fifth vein; third vein slightly bent back toward its tip.

Female.—Face as in the male in color and form, except that there is a conspicuous transverse suture before the lower edge of the bronze part and the yellow portion has no distinct depressions with a sharp ridge between them as in the male; the lower edge is also rounded; the antennae are sometimes almost wholly black; costa without an enlargement; fore femora without the long bristles below; otherwise about as in the male.

Described from one male and four females, taken by J. M. Aldrich, May 11, 1926, at El Jicara, Zacapa, Guatemala.

Type.—Male, Cat. No. 41062, U.S.N.M.

POLYMEDON NIGRICORNIS, new species

Male.—Length, 4.5 mm. Face and front silvery white, face extending about twice its width below the eyes; palpi small, black, rounded; antennae (fig. 62) black; first joint with hairs above; third with a small yellowish spot below at base; proboscis black; lower orbital cilia rather long, whitish, the black cilia descend to about the middle of the eye.

Thorax shining green with violet reflections, which extend upon the base of the scutellum; a rather broad line of silvery white pollen extends from the root of the wing to the front of the thorax; pleurae and coxae with silvery white pollen. Abdomen green with spots of white pollen on the sides of the segments; hairs and bristles of the thorax and abdomen black. Hypopygium black, upper surface more yellow; its lamellae (figs. 63 and 64) somewhat triangular with a

short projection on the side and a long one at tip, the latter with long yellow hairs on the edge and long, slightly clavate yellow bristles on the surface of one side; the lamellae are yellow on basal part, brown at apex.

Fore coxae yellow with a narrow black ring near the base, anterior surface with a few minute black hairs; middle and hind coxae black with yellow tips; femora and tibiae yellow; tips of posterior femora slightly brown above, their tibiae also brown at tip on posterior surface; basal half or more of fore and middle tarsi yellow, hind tarsi almost wholly black; middle tarsi with the usual bend between second and third joints (fig. 65 shows the form of these joints from above), which only shows from the side; joints of fore tarsi as 51-16-13-9-13; those of middle ones as 68-29-23-15-13; joints of posterior pair as 51-53-35-21-17. Calypters brown with black cilia, which are very long and dense, more brown toward the tips of the hairs. Halteres yellow.

Wings (fig. 66) uniformly tinged with blackish brown; last section of fourth vein nearly evenly arched, its tip before the apex of the wing; last section of fifth vein bent, ending about half way to wing margin; first section of costa enlarged so as to fill most of the costal cell.

Female.—Color of all parts as in the male; face reaching a little below the eyes, ending in a rounded point; calypters yellow at base, black on apical half, their cilia normal, black; venation as in the male, except that the costa is not enlarged and fifth vein is curved, not bent as in the male and nearly or quite reaches the wing margin.

Described from five males and three females taken by J. M. Aldrich, May 25, 1926, at Tamau, Alta Vera Paz, Guatemala. All *paratypes* and the *allotype* were taken at the same time and place.

Type.—Male, Cat. No. 41063, U.S.N.M.

This form differs from *nimius* Aldrich in the color of the antennae; *dilaticosta* which I described from Arizona is still closer to *nimius*, but seems to differ in the bend of the last section of fourth vein (fig. 67); both *nigricornis* and *dilaticosta* differ in having the bend between second and third joints of middle tarsi much less conspicuous and plain, while in *nimius* the second joint is distinctly but gradually enlarged and smooth on the side with about four bristles at tip, which project into the bend, the third also has a projection on the side near the middle, the apical end of which is abrupt.

POLYMEDON PARTITUS, new species

Male.—Length 4.7 mm. Face and front silvery white, face extending about its width below the eyes; palpi black, rather long; proboscis black; antennae wholly black, first joint not elongated, about as long as third, which is slightly longer than wide; lateral

and inferior orbital cilia whitish, rather long, about four of the upper cilia on each side black, two hairs or bristles next to the proboscis black.

Thorax green with violet reflections; the stripe of silvery white pollen extending from the base of the wings to the front of thorax is wide at the suture, narrow in front. Abdomen green, each segment with a black posterior border and a spot of white pollen on each side; hairs and bristles of thorax and abdomen black. Hypopygium black, its lamellae (fig. 68) triangular, black with a yellow stem, fringed with pale hairs on outer edge and black, clavate bristles on apical margin.

Coxae black with black hair and bristles and yellow tips; femora and tibiae yellow, knees and tips of tibiae of posterior legs infuscated; tarsi black, only a little yellowish at base; middle tarsi with the usual bend between the second and third joints rather small; joints of anterior tarsi as 40-13-12-8-12; of middle ones as 61-32-16-13-14; joints of posterior pair as 46-49-31-19-18. Calypters brown with apical half black, their cilia normal, rather long, black; halteres yellow.

Wings (fig. 69) tinged with brown in front of fifth vein to cross vein, beyond that to fourth vein, hind margin of wing more gray; last section of fourth vein bent at basal third; first section of costa thickened a little on basal portion to a narrow break in the thickening; beyond this break it is much thickened, tapering to the tip.

Female.—Colored as in the male, except that the bases of the calypters are more yellow; face reaching a little below the eyes, rounded below; palpi reaching a little below the face; venation as in the male; wings not quite as brown.

Described from three males and three females taken by J. M. Aldrich, May 1, 1926, at El Salto, Antigua, Guatemala; all paratypes and the allotype were taken at the same time and place.

Type.—Male, Cat. No. 41064, U.S.N.M.

POLYMEDON RUBIGINOSUS, new species

Female.—Length 4 mm. Face white, more yellowish on upper portion, ending in an obtuse point a little below the eyes; front green, opaque with gray pollen in certain lights; palpi brown; proboscis largely white with yellow hairs; lower orbital cilia whitish.

Thorax and scutellum blue-green, the latter with a coppery spot on each side, dorsum of thorax covered with rather abundant brown pollen, which is very conspicuous when viewed from in front; a velvety black stripe above the root of the wing and a silvery stripe from the wing to the humeri, both conspicuous when viewed from the right direction. Abdomen blue-green, with obscure black pos-

terior margins to the segments and small spots of white pollen on the sides.

Fore coxae wholly yellow, with conspicuous black hair on anterior surface and black bristles at tip; middle and hind coxae black, with their tips narrowly yellowish; femora and tibiae yellow, posterior tibiae narrowly black at tip; middle tibiae with a row of bristle-like hairs on lower anterior edge, these hairs are not as long as diameter of the tibia; fore and middle tarsi black from the tip of the first joint; posterior tarsi almost wholly black; joints of fore tarsi as 43-13-12-8-11; of middle ones as 54-28-20-12-12; joints of posterior tarsi as 44-44-27-10-14.

Wings (fig. 70) grayish; last section of fourth vein much bent at its middle, its tip before the apex of the wing; last section of fifth vein scarcely as long as the cross vein; third vein only very little bent back at tip; sixth vein rather long, nearly straight, tapering to a point at tip.

Described from a single female taken by J. M. Aldrich, May 25, 1926, at Tamau, Alta Vera Paz, Guatemala.

Type.—Female, Cat. No. 41065, U.S.N.M.

POLYMEDON NOTATUS, new species

Male.—Length 4 mm. Face silvery white, one-fourth the width of the head, nearly flat, reaching down to the lower margin of the eyes, its sides nearly parallel, lower edge rounded; front covered with silvery white pollen, a little wider than the face; palpi and proboscis black; occiput black, when viewed from the rear it shows two large, conspicuous spots of white pollen separated by the black ocellar tubercle; antennae wholly black, third joint a little longer than wide, somewhat conical in outline; arista black, pubescent, rather thick, one-fourth longer than the antenna; orbital cilia yellowish white below.

Dorsum of thorax dark shining green with a large spot of silvery white pollen at the suture; scutellum a little more coppery; pleurae and coxae covered with thin silvery white pollen; abdomen black with slight green reflections, dulled with white pollen and with spots of the same on the sides of the segments. Hypopygium black, its outer lamellae black, rather large, somewhat round in outline with a short petiole, they have a fringe of long black hairs on the edge, which are somewhat concentric with the lamellae; the inner appendages are a pair of black, hooked organs and two pairs of yellow bristles; the central organ is inserted at the base of the hypopygium and with its sheath is black at base, suddenly narrowed, sharply pointed at tip, pale yellow from near the middle, very slender and reaching a little beyond the end of the hypopygium.

All coxae, femora, apical third of posterior tibiae, the fore and middle tarsi from the tip of first joint and the whole of hind tarsi black; tips of fore femora and all tibiae yellow; trochanters yellow; femora with short hair, no longer ones below; fore tibiae without bristles below; middle tibiae with three bristles on lower anterior surface; posterior tibiae with rather long hair below and numerous large bristles above; posterior basitarsi with a large bristle near the base below, which is not erect, and with spurs at the tips of the joints; joints of fore tarsi as 35-11-8-8-10; of middle ones as 46-25-21-12-13; joints of posterior ones as 40-40-30-18-16. Calypters black with rather long black cilia, which are inclined to cluster into one mass. Halteres yellow.

Wings tinged with brown, darkest along the veins; costa much swollen opposite the middle of first vein and a little thickened opposite the base of third vein; third vein nearly straight, but very slightly arched; last section of fourth vein bent at its middle, beyond this bend it is arched so as to approach third at tip, reaching the wing margin some distance before the apex of the wing; cross vein 22, last section of fifth vein thirty-one fiftieths of a millimeter long.

Described from one male, taken by J. M. Aldrich, May 25, 1926, at the head of the Polochic River, Alta Vera Paz, Guatemala.

Type.—Cat. No. 41066, U.S.N.M.

Genus *SARCIONUS* Aldrich

Sarcionus ALDRICH, *Biologia*, Dipt., vol. 1, 1902, p. 341; Kansas Univ. Sci. Bull., vol. 1, 1902, p. 47; Trans. Amer. Ent. Soc., vol. 30, 1904, p. 273.

SARCIONUS MACULATUS, new species

Male.—Length 3 mm. Face moderately wide, silvery white, not reaching the lower margin of the eyes; front blue with brownish pollen; palpi and proboscis brown; antennae yellow, third joint very small, shorter than wide, the arista dorsal, broken in the male but still having several long hairs, in the female long plumose; lateral and inferior orbital cilia yellowish.

Thorax and abdomen dark green, not very shining; thorax with an indistinct coppery vitta; the spot of white pollen at the suture small. Hypopygium black with the lower surface yellowish, its petiole long and quite slender; the lamellae oval, moderately large, whitish with a large, dark brown, apical spot; between the lamellae are small yellow inner appendages and basally from these are black, hooklike appendages; the central organ is reddish yellow and curved.

Fore coxae wholly yellow with small black hairs and several black bristles; middle and hind coxae black; all femora and tibiae yellow; tibiae without bristles below; hairs on all femora short, black, no longer ones below; fore tarsi yellow with the extreme tips of the

joints brown; middle and hind tarsi brown from the tip of the first joint; joints of fore tarsi as 41-18-16-5-8; of middle ones as 44-26-20-10-9; joints of posterior pair as 36-45-30-18-12. Calypters and halteres yellow, the former with black cilia.

Wings gray, rather narrow; first vein reaching half way to the cross vein; third vein straight; last section of fourth vein abruptly bent beyond its middle, then arched so as to be parallel with third vein and running quite close to it for some distance at tip; cross vein 19, last section of fifth vein eighteen-fiftieths of a millimeter long.

Female.—Face about twice as wide as in the male and with its sides parallel; third antennal joint mostly brown; palpi and proboscis yellowish; middle tibiae with two bristles below; otherwise about as in the male.

Described from one male and one female taken by J. M. Aldrich, May 7, 1926, at Quirigua, Guatemala.

Type.—Male, Cat. No. 41069, U.S.N.M.

Genus PELASTONEURUS Loew

Pelastoneurus LOEW, Neue Beitr., vol. 8, 1861, p. 36; Mon. North Amer. Diptera, pt. 2, 1864, p. 103, table of species.—ALDRICH, Kansas, Univ. Quart., vol. 2, 1893, p. 152; Biologia Central Amer., Diptera, vol. 1, 1901, p. 336, table of Mexican species; Kansas Univ. Sci. Bull., vol. 1, 1902, p. 47, table of species.—WHEELER, Proc. California Acad. Sci., vol. 2, 1896, p. 11, table of species.—VAN DUZEE, Ann. Ent. Soc. Amer., vol. 16, 1923, p. 44, table of species.

PELASTONEURUS CAERULEUS Van Duzee

Pelastoneurus caeruleus VAN DUZEE, Annals Ent. Soc. of America, vol. 16, 1923, p. 37.

This species was described from Guatemala. J. M. Aldrich took two males, May 1, 1926, at El Salto, Antigua; one female, May 7, at Quirigua; and three females, April 14 and 16, at La Providencia, Obispo, all in Guatemala. Nathan Banks took one female, August 8, 1924, at Bella Vista, Panama.

PELASTONEURUS MACULITIBIA, new species

Male.—Length, 4.2 mm. Face wide, grayish white, more white below, suture below the middle; front violet on the sides, blackish in the middle; palpi black with a narrow yellow margin; antennae black, first two joints very slightly reddish yellow below, third joint nearly circular, not quite as long as wide; arista feathered with long hairs; lateral and inferior orbital cilia silvery white.

Dorsum of thorax shining brown with green reflections, dulled with brown pollen; pleurae more black with silvery-white pollen;

posterior slope of thorax with thin white pollen; the usual velvety black stripe above the root of the wing and the silvery spot at the suture indistinct. Abdomen green, incisures and hair black, its dorsum with considerable white pollen, spots of white pollen on the sides of the segments, last segment wholly white pollinose. Hypopygium moderately large, nearly sessile, black, dulled with white pollen, lamellae elongate, rounded at tip, fringed with long black hairs, nearly half as long as the hypopygium.

All coxae, more than half of posterior surface of fore femora, narrow tips of posterior femora and all tibiae and tarsi black; trochanters, remainder of fore femora, middle and hind femora, lower surface of fore tibiae, middle basitarsi except tip, and three or four elongated spots on upper edge of each middle and hind tibia yellow; fore tarsi (fig. 71) with one claw enlarged to form a grasping organ; joints of fore tarsi as 22-97-7-11; claw as 10; joints of middle tarsi as 39-21-18-15-12; those of posterior pair as 31-39-30-18-16. Calypters and halteres yellow, the former with black cilia.

Wings grayish; third vein nearly straight; last section of fourth vein arched from the cross vein to its tip, which is close to the tip of third vein and in front of the apex of the wing.

Described from two males and three females; one male, the type, was taken at El Salto, Antigua, Guatemala, May 1, 1926; the rest at San Cristobal, Alta Vera Paz, Guatemala, May 17, 1926; all were collected by J. M. Aldrich.

Type.—Male, Cat. No. 41070, U.S.N.M.

This is very nearly like *unguiculatus* Aldrich and *nigrifacies* Van Duzee; from the latter it differs in having the face wholly pollinose; from the former in having the face wholly without the median longitudinal depressed line, which is so conspicuous in *unguiculatus*.

PELASTONEURUS ACUTICAUDA, new species

Male.—Length 2.3 mm. Face wide, silvery white, its sides parallel, the suture near the middle, lower edge nearly straight; palpi and proboscis black; front bluish, dull with gray pollen; antennae (fig. 72) yellow, first joint narrowly brown above, third joint mostly brown, about as long as wide, rounded; lateral and inferior orbital cilia white.

Dorsum of thorax brown, with slight purple reflections and brown pollen, quite shining; the velvety black stripe above the root of the wing not very conspicuous, the spot of white pollen at the suture prominent; pleurae green with white pollen. Abdomen blackish metallic with green and coppery reflections and spots of white pollen on the sides of the segments. Hypopygium (fig. 73) black, its

lamellae long and narrow, black, yellow at base, fringed with long hairs.

Coxae, femora, tibiae, and fore tarsi wholly yellow; middle and hind tarsi brown, more yellow at base; joints of fore tarsi as 20-9-7-6-5; of middle ones as 25-16-14-10-8; joints of posterior pair as 23-32-21-15-11. Calypters and halteres yellow, the former with rather long black cilia.

Wings grayish; third vein a little arched; last section of fourth vein bent at forty-fiftieths of a millimeter beyond the cross vein, beyond this bend it is thirty-fiftieths to wing margin and a very little arched, its tip before the apex of the wing; last section of fifth vein 23, cross vein twelve-fiftieths of a millimeter long; cross vein slightly oblique; hind margin of wing scarcely indented at tip of fifth vein.

Described from one male taken by J. M. Aldrich, May 1, 1926, at El Salto, Guatemala.

Type.—Male, Cat. No. 41071, U.S.N.M.

PELASTONEURUS FUSCIPENNIS, new species

Female.—Length, 3 mm. Face wide, brown pollinose with a narrow edge of white pollen along the orbits and extending to the tip, the suture very high, making the lower portion about twice as long as upper part, it is very bulging and quite pointed at tip, extending nearly or quite to the lower corner of the eyes; palpi large, brown, covered with whitish pollen and black hair; front with the brown pollen of the face extending up to the ocellar tubercle, the tubercle and a narrow band on the orbits blue-black; lateral and inferior orbital cilia yellowish white; antennae yellow, most of third joint and arista brown; arista feathered with long scattering hairs.

Thorax wholly black, in the type somewhat shining. Abdomen black, metallic, posterior half of the segments a little coppery, dorsum dulled with brown pollen, sides of segments with spots of white pollen.

Fore coxae and all femora, tibiae and basitarsi yellow, all tarsi black from the tip of the first joint; middle and hind coxae black; joints of fore tarsi as 29-13-9-6-8; of middle ones as 38-20-18-10-10; first two joints of posterior tarsi as 29-39. Calypters and halteres brownish yellow, apical half or more of the knobs of the halteres yellow, cilia of the calypters black.

Wings tinged with blackish, posterior cells a little lighter, cross vein and a spot on bend of fourth vein darker; last section of fifth vein, if extended to the wing margin, would be 22, cross vein nineteen-fiftieths of a millimeter long; last section of fourth vein from the cross vein to the bend 35, from the bend to tip of fourth vein at wing

margin forty-sixth fiftieths, this portion of fourth vein nearly straight and ending considerably before the apex of the wing; third vein arched so its tip is close to that of fourth; posterior margin of wing distinctly notched at tip of fifth vein.

Described from one female, taken by W. A. Kellerman, at Los Amates, Guatemala.

Type.—In the Museum of Comparative Zoölogy.

This female can be recognized by the long lower part of the face, which is mostly brown, the black wings, yellow antennae and pale orbital cilia.

PELASTONEURUS PECTINATUS, new species

Male.—Length 4.7 mm. Face silvery white with the green ground color showing through on upper fourth, wide, its sides nearly parallel, the suture below the middle; palpi black with a yellow margin, covered with white pollen and black hair; antennae yellow, third joint mostly brown, about as long as wide, rounded at tip; lateral and inferior orbital cilia white, the longer bristles under the head yellow.

Dorsum of thorax blue-green with a median bronze stripe, anterior portion of thorax more coppery; pleurae green, covered with white pollen; the velvety black stripe above the root of the wing and the silvery white spot at the suture not very distinctly limited, a very small spot of white pollen on posterior angles of thorax. Abdomen shining green; posterior margins of segments narrowly black; large spots of white pollen on the sides of the segments; last segment wholly white pollinose. Hypopygium large, scarcely petiolate, black, dulled with white pollen, its lamellae (fig. 74) black with a row of blunt black bristles along the edge and several long hairs near the base.

Fore coxae, all femora and tibiae wholly yellow; middle and hind coxae black with narrow yellow tips; middle tibiae with one large bristle below near apical fourth and one on anterior surface before the middle; fore tarsi yellow with the fifth joint brown; middle and hind tarsi mostly brown or blackish; joints of fore tarsi as 33-19-17-13-12; of middle ones as 50-32-24-15-11; joints of posterior pair as 36-47-34-21-15. Calypters and halteres yellow, the former with black cilia.

Wings grayish, almost brownish; third vein nearly straight; fourth vein bent near the middle of its last section, a little arched beyond the bend, reaching the wing margin before the apex of the wing; last section of fifth vein, if continued to wing margin would be 29, cross vein nineteen-fiftieths of a millimeter long; hind margin of wing with a small notch at tip of fifth vein.

Female.—Face wider, the pollen grayish white, almost brown on lower portion, its suture a little below the middle, upper part showing some green color below the antennae; front shining blue-green. Color of thorax, legs, feet and wings, and the venation of wings as in the male.

Described from six males and three females, La Providencia, Obispo, Guatemala, April 14; one pair, Quirigua, Guatemala, May 7; and one female, Ingenio R. R. station, near Guatemala City, April 28; all taken by J. M. Aldrich in 1926.

Type.—Male, Cat. No. 41072, U.S.N.M.

This may be something like *asciaeformis* Becker, described from Georgia, but in that species the face and front are both gray pollinose, in this the face is silvery white and the front shining blue-green.

EXPLANATION OF PLATES

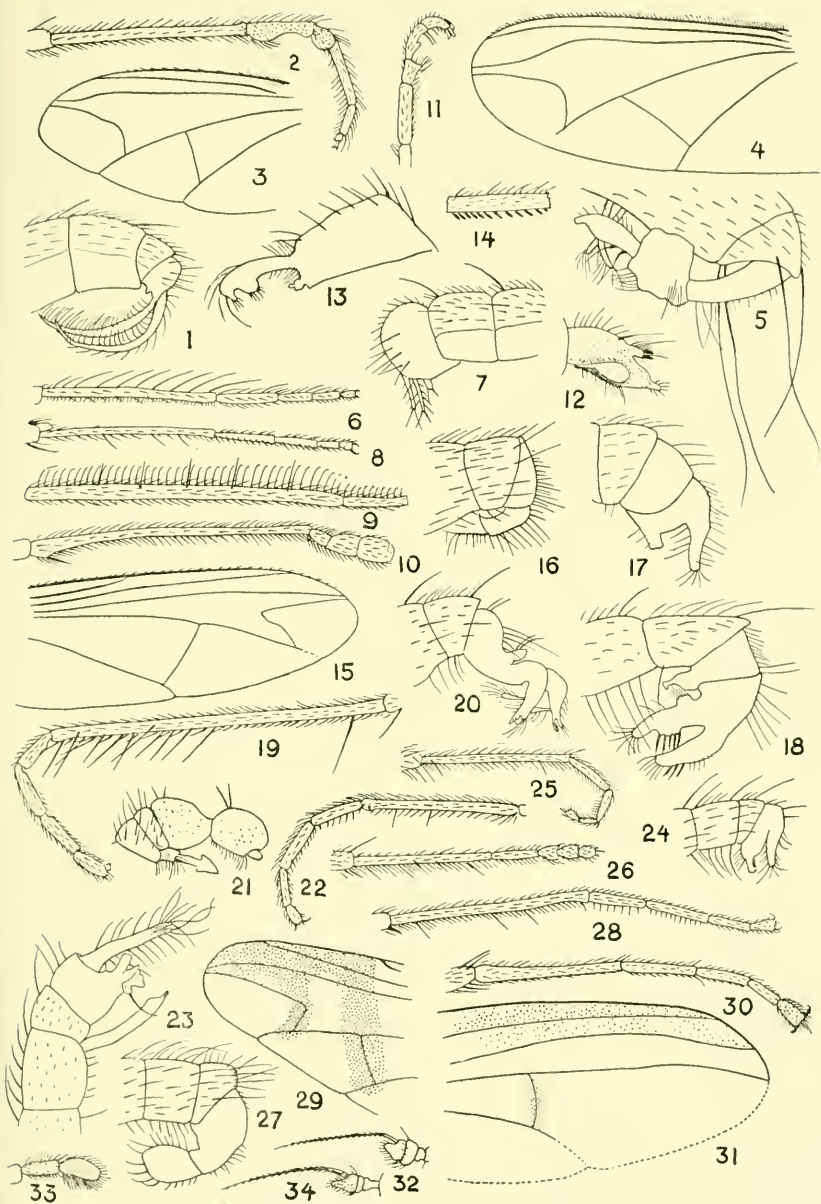
PLATE 1

- FIG. 1. *Psilopus bilobus*, new species, hypopygium of male.
2. *Psilopus bilobus*, new species, fore tarsus of male.
3. *Psilopus bilobus*, new species, wing of male.
4. *Psilopus longipes*, new species, wing.
5. *Psilopus semicomatus*, new species, hypopygium of male.
6. *Psilopus semicomatus*, new species, fore tarsus of male.
7. *Psilopus planipes*, new species, hypopygium of male.
8. *Psilopus mensor*, new species, fore tarsus of male.
9. *Psilopus mensor*, new species, first two joints of middle tarsus of male.
10. *Psilopus mensor*, new species, hind tarsus of male, top view.
11. *Psilopus mensor*, new species, last four joints of hind tarsus of male, side view.
12. *Psilopus bicoloripes*, new species, hypopygium of male.
13. *Psilopus longipennis*, new species, hypopygium of male.
14. *Psilopus longipennis*, new species, part of middle basitarsus of male.
15. *Psilopus longipennis*, new species, wing of male.
16. *Psilopus cylindricus*, new species, hypopygium of male.
17. *Psilopus augustatus*, new species, hypopygium of male.
18. *Psilopus semiciliatus*, new species, hypopygium of male.
19. *Psilopus semiciliatus*, new species, fore tarsus of male.
20. *Psilopus panamensis*, new species, hypopygium of male.
21. *Psilopus nitidicauda*, new species, hypopygium of male.
22. *Psilopus nitidicauda*, new species, fore tarsus of male.
23. *Psilopus flaviannulatus*, new species, hypopygium of male.
24. *Psilopus clavatus*, new species, hypopygium of male.
25. *Psilopus clavatus*, new species, fore tarsus of male.
26. *Psilopus clavatus*, new species, hind tarsus of male.
27. *Psilopus simulans*, new species, hypopygium of male.
28. *Psilopus simulans*, new species, fore tarsus of male.
29. *Psilopus nitidicauda*, new species, tip of wing.
30. *Sympycnus imperfectus*, new species, fore tarsus of male.
31. *Sympycnus imperfectus*, new species, wing.
32. *Sympycnus longipes*, new species, antenna of male.
33. *Sympycnus longipes*, new species, last two joints of middle tarsus of male.
34. *Sympycnus filiformis*, new species, antenna of male.

PLATE 2

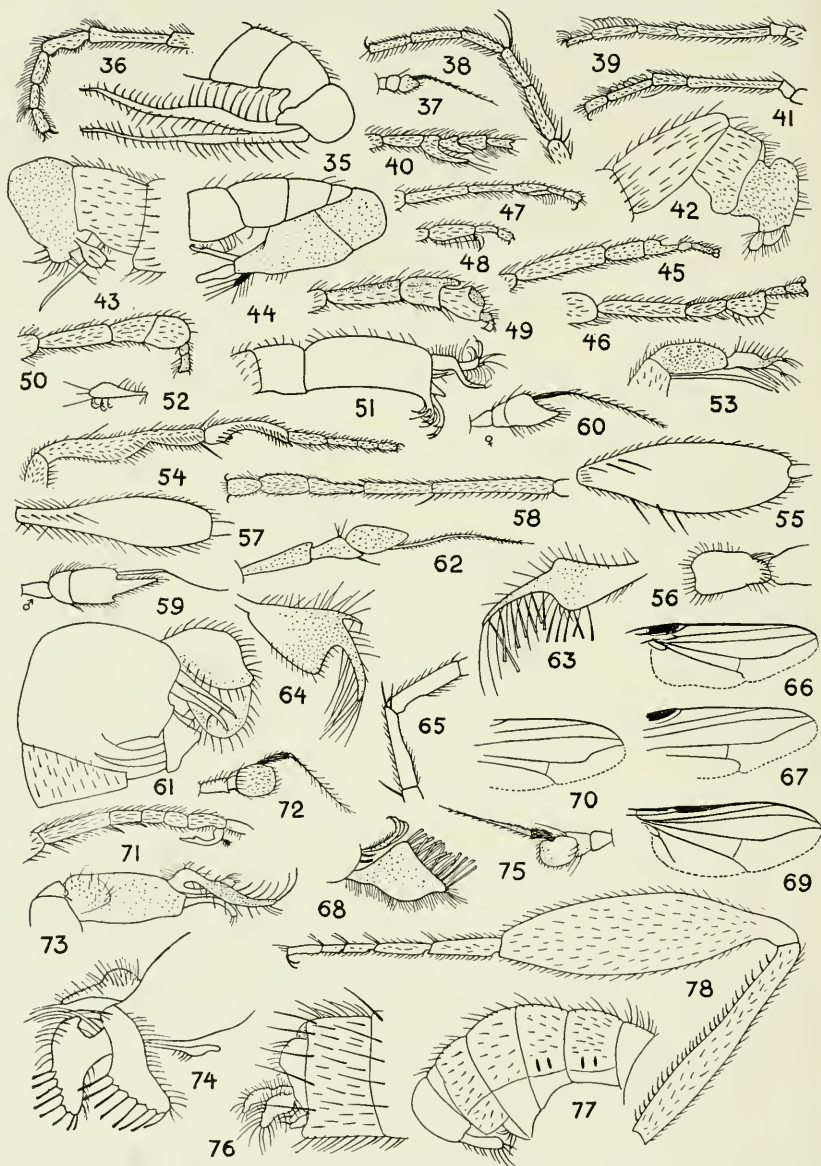
- FIG. 35. *Sympycnus filiformis*, new species, hypopygium of male.
36. *Sympycnus filiformis*, new species, fore tarsus of male.
37. *Sympycnus bipilus*, new species, antenna of male.
38. *Sympycnus bipilus*, new species, hind tarsus of male.
39. *Nothosympycnus furcatus*, new species, fore tarsus of male.
40. *Nothosympycnus furcatus*, new species, middle tarsus of male.
41. *Nothosympycnus unipilus*, new species, fore tarsus of male.
42. *Neurigona banksi*, new species, hypopygium of male.
43. *Neurigona maculipennis*, new species, hypopygium of male.
44. *Thinophilus panamensis*, new species, hypopygium of male.
45. *Medetera abrupta* Van Duzee, fore tarsus of male.
46. *Medetera varipes*, new species, fore tarsus of male.
47. *Medetera pollinosa*, new species, fore tarsus of male.
48. *Medetera pollinosa*, new species, last two joints of same.
49. *Medetera flavipes* Van Duzee, fore tarsus of male.
50. *Medetera scaura*, new species, fore tarsus of male.
51. *Medetera pallidicornis*, new species, hypopygium of male.
52. *Medetera pollinosa*, new species, hypopygial lamella of male.
53. *Thrypticus acuticauda*, new species, hypopygium of male.
54. *Chrysotus contractus*, new species, middle leg of male.
55. *Paraclius latitibia*, new species, fore tibia of male.
56. *Paraclius fusiformis* Becker, hypopygial lamella of male.
57. *Paraclius fusiformis*, fore tibia of male.
58. *Paraclius fusiformis*, middle tarsus of male.
59. *Paraclius acuticornis*, new species, antenna of male.
60. *Paraclius acuticornis*, antenna of female.
61. *Polymedon transversus*, new species, hypopygium of male.
62. *Polymedon nigricornis*, new species, antenna of male (inverted).
63. *Polymedon nigricornis*, hypopygial lamella, showing the flattened bristles on inner surface.
64. *Polymedon nigricornis*, same, showing the lamella with the flattening of bristles concealed.
65. *Polymedon nigricornis*, second and third joints of middle tarsus of male, side view.
66. *Polymedon nigricornis*, wing of male.
67. *Polymedon dilatocosta* Van Duzee, wing of male.
68. *Polymedon partitus*, new species, hypopygial lamella of male.
69. *Polymedon partitus*, wing of male.
70. *Polymedon rubiginosus*, new species, wing of female.
71. *Pelastoneurus maculitibia*, new species, fore tarsus of male.
72. *Pelastoneurus acuticauda*, new species, antenna of male.
73. *Pelastoneurus acuticauda*, hypopygium of male.
74. *Pelastoneurus pectinatus*, new species, hypopygial lamella of male.
75. *Keirosoma albicinctum*, new species, antenna of male.
76. *Keirosoma albicinctum*, tip of abdomen.
77. *Oedematopus crassitibia*, new species, abdomen of male.
78. *Oedematopus crassitibia*, posterior leg of male.





DETAILS OF THE FLIES OF THE FAMILY DOLICHOPODIDAE

FOR EXPLANATION OF PLATE SEE PAGE 63



DETAILS OF THE FLIES OF THE FAMILY DOLICHOPODIDAE

FOR EXPLANATION OF PLATE SEE PAGE 64

SYNOPSIS AND DESCRIPTION OF NORTH AMERICAN TADPOLES

By A. H. WRIGHT

Of Cornell University, Ithaca, N. Y.

The material upon which the paper is based has been collected for the greater part by the author during many years of field work and study. A full and representative series is in the author's collection and another has been donated by him to the United States National Museum.

The investigations have been supported by grants from the Heckscher Foundation for the Advancement of Research, established at Cornell University by August Heckscher.

The author extends acknowledgments to Dr. Leonhard Stejneger and Miss Doris M. Cochran for their many courtesies.

1. SYNOPSIS OF THIRTY-EIGHT SPECIES OF TADPOLES, MOSTLY FROM EASTERN AND SOUTHERN UNITED STATES

The following synopsis is a summarized account of some of the tadpoles the author has collected (except *Ascaphus truei*). As indicated in the subtitle, the synopsis is not complete for all forms east of the Mississippi River, as the following eastern forms are not included:

Bufo quercicus.—
Bufo fowleri.—

{	Material at hand but not worked over until all Bufo species of United States of America are assembled. They are difficult.
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Pseudacris.—In addition to what is included we have eggs and tadpoles of *Pseudacris* from Texas and some studies on *Pseudacris ornata*. Their life histories are being assembled.

Hyla avivoca.—Mr. Percy Viosca, jr., its discoverer, knows this species well and doubtless will solve its life history.

Rana areolata.—Mr. George S. Myers and his previous associates (such as Hermann P. Wright) at the University of Indiana are supplying this gap in the series.

Rana cantabrigensis.—We have some of this material, but Mr. E. B. Shelley-Logier has the most on this species.

In addition, we have added to the synopsis 11 species of the Southwest, the results of our 1917 and 1925 trips. The discussion of the relationships of these tadpoles is reserved for a forthcoming paper.

Some may attempt to use this synopsis as a key. It may work and at times it will not. To any worker who has had much field experience it is apparent that tadpoles of closely related species like other animate things are no respecters of man-made keys. Variations in individuals will occur. This is a synopsis of mature larvae. Half-grown larvae or larvae close to transformation or almost transformed are often quite abnormal in the usual characters used in larval descriptions. For example, we raised *Rana virgatipes* larvae from eggs, but they did not attain a large enough size to get the labial teeth well developed. We had to secure another series of mature larvae to complete the description.

The tadpoles and eggs of most of the United States species are known. The Pacific coast forms have been thoroughly studied by Dr. Tracy I. Storer. We have collected in the field the tadpoles and eggs, or both, of over 40 of the species of the United States and are hopeful of seeing in life the eggs and tadpoles of the remaining forms before final summaries are undertaken. In this synopsis the only real presumptive identification is that of *Rana onca*, and a correction is made when *Scaphiopus hammondi* is given as having stalked eggs at times. In 1920¹ we published a figure of stalked eggs with the identification "Desert Tree Toad (?) Eggs," i. e. *Hyla arenicolor*. The question mark saves the situation. Later we found them to be *Scaphiopus hammondi* eggs, and Dr. A. I. Ortenburger had also independently come to the same judgment.

All the drawings of the mouth parts have been made by my wife, Mrs. Anna Allen Wright, who has also seen many of these tadpoles in life and who has helped to photograph most of them.

SYNOPSIS

- a¹. Mouth disk absent; no labial teeth; no papillae; no horny beaks; spiracle median near anus; nostril within edge of mouth fold; eye on a canthus; tadpoles (23-26.4 mm.) small; black or grayish olive tadpoles with a stripe on the middle of the tail musculature-----(*Brevicipitidae*).
b¹. Tail tip always black; eyes just visible from ventral aspect; back of upper labial edge with black pointed excrescences; lower mandibular prolongation gray; general coloration citrine drab or grayish olive, with mid dorsal of dark grayish olive; venter with white or pale pinkish cinnamon spots; sides of body without striking longitudinal light bands; light band at base of tail musculature not prominent (in alcohol).

Outer egg envelope not truncate, mass seldom showing distinct outline of each egg envelope in a mosaic fashion.

Texas westward to Fort Davis Mountains. (Pl. 1, fig. 1.)

Gastrophryne texensis.

¹ U. S. Bur. of Fisheries, Doc. No. 838, 1920, pl. 17, fig. 2.

- b*¹. Tail sometimes with black tip; eyes plainly visible from ventral aspect; inner face of upper labial edge with no black pointed excrescences; lower mandibular prolongation light; general coloration black with purplish gray or hair brown dots; venter with white or yellowish bands and large blotches; sides of body with same coloration; light band at base of tail musculature prominent (even in alcohol).

Egg with truncate outer envelope, giving mass a mosaic appearance on water's surface.

Virginia—Florida—Texas, and up Mississippi River to Indiana. (Pl. 1, fig. 5.)

Gastrophryne carolinensis.

- a*². Mouth disk present; upper and lower labial teeth; labial papillae; at least the upper horny beak present; nostril free of mouth; eyes dorsal close together; tail tip rounded.

- b*¹. Spiracle median near insertion of hind legs than tip of snout; labial teeth $\frac{7}{8}$ to $\frac{3}{4}$ to 6; upper labial teeth at least two rows to a ridge; no lower beak; many rows of papillae on edge of lower labium; mouth large and round; anus median; black or blackish brown tadpoles speckled with black; tail may be of body color or spotted with creamy white; upper tail crest not extending on to the body. (After Gaige.)

Washington—California. (Pl. 1, fig. 6.)----*Ascaphus truei* (Discoglossidae).

- b*². Spiracle sinistral; upper labial teeth not with two close rows on each ridge; labial teeth $\frac{1}{2}$, $\frac{2}{3}$, $\frac{2}{3}$, $\frac{2}{3}$, $\frac{3}{4}$, $\frac{3}{4}$, $\frac{4}{5}$ to $\frac{5}{6}$; upper and lower horny beaks; papillae on lower edge of labium absent or in one or two rows.

- c*¹. Anus median; spiracle lateral below the lateral axis (of tail musculature projected) sometimes as much ventral as lateral; upper tail crest extends on to the body to a vertical nearer hind legs than the spiracle or only half way; viscera visible (in preserved specimens) through the skin of the belly.

- d*¹. Labial teeth $\frac{3}{4}$ to $\frac{5}{6}$; papillae extending completely around the border of the labium except for a short toothed median interval above (sometimes absent in one species); papillary border not emarginate on each side; eyes nearer mid-dorsal line than lateral outline, on lateral axis; tadpoles 24.5–65 mm. in length; spiracle a slit, very low on side, about on the level of the mouth; in general very bronzy tadpoles; myotomes of tail musculature well indicated.----- (Scaphiopodidae).

- e*¹. Teeth $\frac{5}{6}$, $\frac{5}{6}$, $\frac{5}{6}$, $\frac{5}{6}$; inner papillae present; spiracle equidistant between eye and base of hind legs or vent; eye 1.4–1.8 nearer tip of snout than to the spiracle, average 1.52; internasal space in interorbital space 1.28–1.83, average 1.56; depth of body 1.75–2.5 in body length, average 2.04; muscular part of tail in depth of tail 1.45–2.5, average 1.98; last lower row of teeth longer than horny beak. Last lower row of teeth 1.5 times in next to lowest row of teeth. Egg mass an irregular cylinder, at first bandlike.

Massachusetts—Florida—Texas, and Arkansas. (Pl. 1, fig. 4.)

Scaphiopus holbrookii.

- e*². Teeth $\frac{3}{4}$, $\frac{3}{4}$, $\frac{3}{4}$, $\frac{3}{4}$; inner papillae generally absent or scarce; spiracle nearer eye than hind legs or vent; eye 1.0–1.6 nearer tip of snout than to spiracle; depth of body 1.6–2.0 in body length, averages 1.79, 1.9; last lower (fourth) row of teeth less than or $\frac{1}{2}$ of the horny beak.

- f*¹. Tadpole large (65 mm.); teeth $\frac{3}{4}$, rarely $\frac{3}{4}$ or $\frac{3}{4}$; upper fringe of papillae broken in middle by a row of teeth; eye 1.1–1.3 nearer tip of snout than to the spiracle, average 1.2; muscular part of tail 2.25–2.66 in depth of tail, average 2.43; width of body in its own length 1.55–1.9, average 1.66; depth of body 1.05–1.15 in body width, average 1.09; spiracle 1.25–1.6 nearer eye than base of hind legs or vent, average 1.37; internasal space 2.5–2.75 in interorbital space, average 2.6; third lower labial row usually broken in

middle; median interval of second lower row broad; last lower row of teeth 1.75–2.0 times in next to last row of teeth; second upper row usually broken in middle. Egg mass, a loose cylinder, many eggs on stalks.

Montana–Texas and westward to Pacific Coast States. (Pl. 1, fig. 3.)

Scaphiopus hammondi.

- f*². Tadpole small (24.5 mm.); teeth usually $\frac{4}{4}$, rarely $\frac{5}{4}$, $\frac{3}{4}$, $\frac{5}{5}$ possible $\frac{2}{4}$; upper fringe of papillae inconspicuously broken in middle by a row of teeth or not so broken, and first row of teeth is absent; eye 1.0–1.6 nearer tip of snout than to the spiracle, average 1.3; muscular part of tail 2.2–3.33 in depth of tail, average 2.7; width of body in its own length 1.3–1.6, average 1.4; depth of body 1.25–1.55 in body width, average 1.35; spiracle 1.5–2.2 nearer eye than base of hind legs or vent, average 1.85; internasal space 1.45–2.3 in interorbital space, average 2.0; third lower labial row continuous; median interval of second lower row very narrow. Last lower row of 2.5–3.0 times in next to lower row of teeth; second upper row not or barely broken in middle; egg mass an irregular cylinder, at first handlike.

Texas–California, Mexico. (Pl. 1, fig. 2.)-----*Scaphiopus couchii*.

- d*². Labial teeth $\frac{2}{3}$; papillae confined to the sides of the labium (on lower half only in *Bufo punctatus*) upper and lower edges toothed; papillary border on each side emarginate; eyes slightly nearer lateral outline than mid dorsal line, above lateral axis; spiracle small, a porelike opening; tadpoles 24–28 mm in length-----*Bufo* *nidae*.

- e*¹. Papillae only on lower half of lateral margin; or a slight marginal row of 4 to 6 papillae on upper half; no inner papillae normally; third lower row of teeth equal to the 1st row of lower labial teeth; median space between lateral parts of the 2nd row of upper labial teeth 2–3 times in either lateral row; horny beak 1.2–1.5 in third lower labial row; tadpoles to 25 mm.

One of the blackest *Bufo* tadpoles; tail musculature evenly dotted with black; venter with light grayish vinaceous spots; eggs single or film or scattered mass on bottom, not in files.

Central Texas–California, Utah, Lower California. (Pl. 5, fig. 5.)

Bufo punctatus.

- e*². Papillae on upper and lower halves of lateral labial margin; some inner papillae.
- f*¹. Bicolor tadpoles, light grayish olive, dark olive buff or clay color; the lightest of our toad tadpoles; in life intestine does not show through the skin of the belly (shows in spirits); third lower row of labial teeth short, 1.8–2.4 in first lower row; third lower row 1.5–2.0 times in the horny beak; median space between lateral parts of the 2nd row of upper labial teeth large, 1–2.0 times greater than either lateral part; depth of tail in length of tail 3.0–3.5; horny beak 1.3–1.4 in first or second lower row of teeth; lower loop of papillae to end of third lower row but not under it, usually not two rows; tail musculature with dark vinaceous drab band to tail tip; below this a pale vinaceous pink band; belly pale vinaceous pink; eggs in files or strings, brown or buffy brown above, cream or straw yellow below; no inner tube.

Texas–Mexico, Arizona. (Pl. 5, fig. 6.)-----*Bufo compactilis*.

- f*². Black or blackish tadpoles; in life intestine shows through the skin of the belly; third lower row of labial teeth long, 1.2–1.6 in first lower row; third lower row 1.0–1.5 in horny beak; median space between lateral parts of the 2nd row of upper labial teeth small, contained 2.0–4.9 times in either lateral half, not greater than lateral half.

- g*¹. Papillae very faint, minute, at times hard to see but present; third lower row of labial teeth not equal to 1st lower row of teeth, but equal to or greater than horny beak; horny beak in upper fringe 1.2–1.5 in upper fringe, 1.3–1.5

in 1st lower row; median space of second upper row 2-4 times in either lateral part of it; upper edge of tail musculature with 8-10 black bars with intervening pale olive buff areas; irregular black or brown band on tail with cartridge buff or tilleul buff on below it; tadpoles to 23 mm.

Eggs in files, inner tube, present, one or two rows of eggs.

Louisiana—Costa Rica. (Pl. 5, fig. 7.)-----*Bufo valliceps*.

g². Papillae plainly visible.

h¹. Tadpole to 24 mm.; horny beak in upper fringe 1.75, in first or second lower row 1.5; horny beak equal to or less than the 3rd lower row of teeth; median space between two parts of second upper row 1.4-2.1 in either lateral part; third lower row of teeth in first lower row 1.2-1.4; two or more rows of strong papillae from end of upper fringe to end of third lower row, sometimes 3-5 rows at side of labium; lower loop of papillae far below level of third row and with at least two rows of papillae; mouth in interorbital space 1.0-1.5, average 1.17; mouth larger than internasal space 1.2-1.6, average 1.36; depth of tail in tail length 2.4-4.5, average 3.27; eye nearer snout than spiracle 1.0-1.57, average 1.2; nostril nearer eye than snout 1.1-1.8, average 1.48. Egg mass long file, inner tube with no partitions.

North Carolina—Florida—Louisiana. (Pl. 1, fig. 9.)-----*Bufo terrestris*.

h². Tadpole to 27 mm; horny beak in upper fringe 1.2-1.5, in first or second lower row of teeth 1.1-1.2 or 1.2-1.3; horny beak greater than 3rd row of lower labial teeth; median space 1.15-2.0, 1-4, or 1.3-3.0 in either lateral part; third lower row of teeth 1.3-1.5 or 1.4-1.5 in first lower row; one row of weak papillae from upper fringe to end of third lower row of teeth with a few scattering papillae at the side of the labium; lower loop with only two or three scattering papillae beside the outer row of weak papillae;

i¹. Mouth in interorbital distance 0.77-1.0, average 0.92; horny beak in upper fringe 1.2-1.4; horny beak in first or second row 1.1-1.2 times; third row in first lower row 1.3-1.5; depth of tail in tail length 1.25-2.7, average 1.97; spiracle nearer eye than vent 1.04-1.54, average 1.28; eye nearer snout than spiracle 1.0-1.27, average 1.16; mouth larger than internasal space 1.4-2.2, average 1.76; papillae of lower labial loop do not extend under the end of the end of the third row of labial teeth; tail musculature in tail depth 1.26-2.66, average 2.04; internasal space 1.2-1.8 in interorbital distance, average 1.6; spiracle 1.05-1.55 nearer eye than vent, average 1.28. Egg mass long file, partitions, inner tube present.

Eastern North America from Hudson Bay southwest. (Pl. 1, fig. 7.)

Bufo americanus.

i². Mouth in interorbital distance 1.07-1.5; horny beak in upper fringe 1.4-1.5; horny beak in first or second row 1.2-1.3; third lower row 1.3-1.6 in first lower row; depth of tail in tail length 2.88-3.83, average 3.33; spiracle nearer eye than vent 1.25-1.7, average 1.45; eye nearer snout than spiracle 1.0-1.6, average 1.16; mouth larger than internasal space 1.1-1.83, average 1.47; papillae of lower labial loop slightly extend or do not at all extend under the end of the third lower row; tail musculature in tail depth 1.6-2.3, average 1.85, internasal space 1.5-2.16 in interorbital space, average 1.86; spiracle 1.25-1.7 nearer eye than vent or base of hind legs, average 1.45. Egg mass long file, no inner tube, sometimes two rows of eggs.

(Raleigh). (Pl. 1, fig. 8.)-----*Bufo*.

c². Anus dextral; spiracle distinctly lateral on or near body axis;

d¹. Papillary border on side with an emargination; tadpoles 50-149 mm. in length; papillary fringe on upper labium extends not at all inward beyond the end of the upper fringe of teeth or only $\frac{1}{2}$ to $\frac{1}{4}$ of the length of the fringe; length of horny beak in upper fringe of teeth 1.0-1.5 times; labial teeth $\frac{2}{3}$ or $\frac{3}{4}$ or $\frac{1}{2}$ or more-----*(Ranidae.)*

- e¹. Labial teeth $\frac{2}{3}$; tadpoles 49–72 mm. in length; dorsal crest very high extending to vertical of the spiracle (*Rana sylvatica*) or tail broader nearer its tip than at its body insertion, rounded, spatulate, or elliptical (*R. boylei sierrae*); upper fringe of teeth about 1.5 times the length of the horny beak.
- f¹. Tadpole to 49 mm.; dorsal crest very high, extends on to the body to vertical of the spiracle; tail tip acuminate; tail musculature begins to taper at once; dorsal crest higher in cephalic half; depth of tail in length of tail 1.9–3.1, average 2.5; spiracle 1.5–2.0 nearer base of hind legs or vent than tip of snout, average 1.75; nostril to snout equidistant to nostril to eye; internasal space in interorbital space 1.7–2.9, average 2.5; depth of body 1.08–1.23 in body width, average 1.14; depth of body 1.66–2.0 in body length, average 1.78; second upper lateral row about $\frac{2}{3}$ of the upper fringe of teeth; the median space between the lateral portions of this second row 0.4–0.8 times either lateral portion; the third upper row is $\frac{1}{4}$ to $\frac{3}{8}$ of the upper fringe; fourth lower row of teeth is $\frac{1}{11}$ to $\frac{1}{7}$ of the first lower row; spiracle 1.0–1.48 nearer eye (5.0–6.0 mm.) than base of hind legs or vent (5.4–7.6 mm.).

Egg mass submerged, globular.

Ontario–Nova Scotia, south to South Carolina. (Pl. 3, fig. 5.)

Rana sylvatica.

- f². Tadpole to 72 mm.; dorsal crest low extending on to body to a vertical twice nearer hind legs than spiracle; tail tip rounded, elliptical or spatulate; tail musculature for an inch or more does not taper; dorsal crest narrow in cephalic half; depth of tail in length of tail 2.5–5.7, average 4.0; depth of body 1.1–1.8 in body width, average 1.43; depth of body in body length 2.0–3.0, average 2.325; spiracle 1.0–1.33 nearer base of hind legs or vent than tip of snout, average 1.17; spiracle 1.45–2.375 nearer eye (4.0–8.0 mm.) than base of hind legs or vent (5.8–12.0 mm.), average 2.05; young tadpoles occasionally with teeth $\frac{2}{3}$ rarely $\frac{3}{4}$; nostril 1.0–1.75 nearer the eye than snout; internasal space 1.3–2.0 in interorbital space, average 1.5; second upper lateral row $\frac{1}{4}$ to $\frac{3}{8}$ of the upper fringe; median space between lateral portions of second upper row 1.0–2.3 times either lateral part; the third upper row is $\frac{1}{8}$ to $\frac{1}{4}$ of the upper fringe; the fourth lower row of teeth is $\frac{1}{4}$ to $\frac{1}{2}$ of the first lower row. (Pl. 3, fig. 4.)

Rana boylei sierrae.

- e². Labial teeth $\frac{2}{3}$ occasionally $\frac{3}{4}$ rarely $\frac{1}{2}$; tadpoles 74–150 mm. in length; dorsal crest not extending to vertical of the spiracle, but usually just ahead of the buds of the hind legs; tail always elliptical not spatulate; upper fringe of teeth equal to or slightly larger (never 1.5 times) the horny beak.
- f¹. Tadpoles 74–84 mm.; tadpoles usually transform the same season they are born; transformation sizes 18–30 mm. average 24 mm. (except *R. aesopus*); tadpoles (except in *R. aesopus*) not strongly pigmented on belly, viscera plainly showing through skin (in spirit specimens).

Egg mass globular or plinthlike beneath surface of water.

- g¹. Body in tail 2.15–2.85, average 2.6; depth of tail in length of tail 2.6–3.5, average 3.0; nostril 1.0–1.5 nearer eye than snout, average 1.25; eye 1.0–1.3 nearer spiracle than snout, average 1.12; median space between the second upper labial row 1.0–2.0 times the length of either lateral part of this row; third lower row 0.33–0.66 shorter than the first or second rows; tail covered with large prominent dark spots; belly strongly pigmented, in spirits it looks white, viscera not visible.

South Carolina–Florida–Louisiana (Viosca). (Pl. 2, fig. 4.)

- g². Body in tail 1.3–2.2, averages (1.53, 1.6, 1.7); depth of tail in length of tail 2.3–3.4, averages 2.7, 2.65, 3.0; belly not strongly pigmented, in spirits dark, viscera show through the skin.

*h*¹. Median space in second upper labial row 2-4 times the length of either lateral part; third row of lower labial teeth 0.33-0.66 shorter than the first or second rows, usually at least 0.50; eye nearer the snout than spiracle or equidistant; nostril nearer eye than tip of snout; depth of tail in length of tail 2.3-3.2, average 2.7; spiracle 1.5-1.8 nearer eye than snout, average 1.63.

Hudson Bay-Louisiana and Eastern States. (Pl. 2, fig. 3.)—*Rana palustris*.

*h*². Median space 0.5-1.0 or 1.0-1.5 times either lateral part of the second upper row; third row of labial teeth 0.22 or 0.285-0.33 shorter than the first lower row; depth of tail in length of tail 2.0-2.8 or 2.7-3.4.

*i*¹. Median space of second upper row 0.5-1.0 times either lateral part; third lower row of teeth 0.285-0.33 shorter than the first lower row; nostril to snout equal to nostril to eye; eye 1.15-1.3 nearer tip of snout than spiracle. average 1.2; body length in tail length 1.35-1.66, average 1.5; mouth 0.9-1.6 larger internasal space; depth of tail in length of tail 2.0-2.88, average 2.65; tail crest usually with white prominent dark spots; greatest length of tadpole 74 mm.; spiracle 1.1-1.86 nearer eye than snout, average 1.46.

Southeastern States-Louisiana. (Pl. 2, fig. 2.)—*Rana sphenoccephala*.

*i*². Median space 1.0-1.5 times either lateral part; third lower row 0.22 shorter than the first lower row; nostril 1.1-1.5 nearer the eye than snout; eye nearer spiracle than snout 1.1-1.3; body length in tail length 1.3-2.0, average 1.7; mouth larger than internasal space; depth of tail in length of tail 2.7-3.4, average 3.0; tail crest usually translucent with fine spots or pencilings; greatest length of tadpole 84 mm.; spiracle 1.4-1.86 nearer eye than snout, average 1.59.

North America east of Sierra Nevada southward into Mexico. (Pl. 2, fig. 5.)

Rana pipiens.

*f*². Tadpoles 84-142 mm.; tadpoles usually winter over at least one season; transformation sizes 28-59 mm. (except *R. virgatipes* 25-35 mm., possibly *R. onca*); tadpoles usually with strongly pigmented bellies, viscera not plainly showing through the skin (in spirit specimens).

*g*¹. Tadpole with prominent continuous black crest margins and a black musculature band; belly bluish; tadpoles to 95 mm.; young tadpoles black with transverse yellowish band on the body; spiracle 0.86-1.2 nearer vent or base of hind legs than snout, average 1.0; spiracle 0.85-1.2 nearer eye than base of hind legs or vent, i. e., usually equidistant; eye equidistant from spiracle and tip of snout; muciferous crypts very distinct; spiracle below lateral axis; tail tip acuminate; second upper labial row in upper fringe $\frac{1}{3}$ to $\frac{1}{4}$; upper fringe distinctly greater than horny beak; median space between two parts of second upper labial row 1 to $1\frac{1}{2}$ of either lateral part; third lower labial row equal to horny beak; third lower labial row longer than single row of lower papillae; third lower labial row $\frac{1}{4}$ to $\frac{1}{5}$ shorter than first lower row. Eggs unknown.

South Carolina-Florida. (Pl. 3, figs. 1, 2.)—*Rana heckscheri*.

*g*². Tadpole without black crest margins or lateral band; belly white, cartridge buff, buff or yellow to maize yellows; no transverse yellow band in young tadpoles; spiracle nearer vent than snout 1.1-1.8; spiracle to eye rarely less than 1.25 greater than spiracle to vent; eye near tip of snout than spiracle 1-1.4; second upper labial row in upper fringe $\frac{1}{4}$ to $\frac{1}{5}$; upper fringe equal to or slightly greater than horny beak; median space in either lateral part $1\frac{1}{2}$ to 11; third lower labial row much less (about $1\frac{1}{2}$) than horny beak; third lower row much shorter or equal to single row of lower labial papillae.

*h*¹. Tadpoles to 140 mm.; eye well above lateral axis; muciferous crypts indistinct; spiracle just below lateral axis; spiracle 1.08-1.44 nearer base of hind legs or vent than tip of snout, average 1.26; depth of tail in tail length of tail

2.4-3.5, average 2.8; tail tip obtuse; second upper row in upper fringe $\frac{1}{4}$ to $\frac{2}{5}$; median space in second upper row $1\frac{1}{2}$ in either lateral part; third lower row in first lower row $\frac{1}{4}$ to $\frac{1}{5}$ shorter; teeth $\frac{2}{3}$ rarely $\frac{3}{4}$. Transformation size 43-59 mm.

Egg mass, surface film.

North America east of Rockies. (Pl. 2, fig. 1.)-----*Rana catesbeiana*.

- h*². Tadpoles to 84-100 mm.; eye on or just above lateral axis; tail tip acute or acuminate (rounded in *R. onca*) teeth $\frac{2}{3}$; second upper row in upper fringe $\frac{1}{4}$ to $\frac{1}{5}$; median space in second upper row 2.5-11 in either lateral part; third lower row in first lower row $\frac{1}{2}$ to $\frac{1}{3}$ shorter.

- i*¹. Depth of tail in length of tail 1.45-1.8, average 1.7; tail tip acuminate; dorsal crest equal or less than tail musculature; muciferous crypts indistinct; spiracle 1.08-1.44 nearer vent than snout; mouth in interorbital distance 1.5-2.37, average 1.94; internasal space in interorbital distance 1.8-2.6, average 2.16; second upper row $\frac{1}{4}$ to $\frac{1}{5}$ of the upper fringe; median space of second upper row $2\frac{1}{2}$ to $4\frac{1}{2}$ times either lateral row; third lower row 1.5 less than horny beak, much shorter than single row of lower labial papillae and $\frac{1}{3}$ shorter than first lower row of teeth; first row of lower teeth equal to horny beak. Transformation size 32 or 37-48 mm.; egg mass, a surface film.

Georgia, Florida-Louisiana. (Pl. 3, fig. 7.)-----*Rana grylio*.

- i*². Depth of tail in length of tail 2.5-4.7 averages 3.1-3.87; tail tip acute; dorsal crest less than tail musculature; muciferous crypts distinct; spiracle 1.07-1.8, nearer vent than snout; mouth in interorbital distance 1.3-1.8, average 1.5; internasal space in interorbital space 1.25-2.0 averages 1.6-1.75; second upper row $\frac{1}{4}$ to $\frac{1}{5}$ of the upper fringe; first lower row of teeth equal to or greater than horny beak; spiracle 1.1-1.8 nearer vent than snout.

- j*¹. Tadpoles to 99 mm.; transformation sizes at 29-38 mm.; depth of tail in length of tail 3.2-4.7, average 3.87; spiracle just touches lateral axis; eye just above lateral axis; spiracle 1.06-1.38 nearer eye than base of hind legs or vent, average 1.24; spiracle 1.25-1.6 nearer eye than vent, 1.45; mouth in interorbital distance 1.3-1.75, average 1.55; width of body in its own length 1.3-2.1, average 1.56; third lower labial row of teeth 1.25 less than horny beak, about equal to single row of lower labial papillae, $\frac{1}{3}$ shorter than first lower row; sometimes a row of inner papillae below the third lower row of teeth; median space in second upper labial row 3.5-4.5 times either lateral portion; second upper row $\frac{1}{4}$ to $\frac{2}{5}$ of the upper fringe; belly straw yellow, colonial buff or deep colonial buff; tail with round cartridge buff or pinkish cinnamon spots; no black line in dorsal crest as in *Rana grylio* or *R. virgatipes*.

Eggs in a compact submerged mass.

Hudson Bay-Minnesota, New York-New England. (Pl. 3, fig. 3.)

Rana septentrionalis.

- j*². Tadpoles to 92 mm.; transformation sizes at 25-38 mm.; depth of tail in length of tail 2.5-3.7, spiracle just below lateral axis; eye on lateral axis; third lower labial row of teeth 1.5-1.25 less than horny beak, much shorter than single row of lower labial papillae, almost $\frac{1}{2}$ shorter than first lower row; median space of second upper row 6-11 times the length of either lateral portion; second upper row $\frac{2}{5}$ to $\frac{1}{5}$ of the upper fringe.

- k*¹. Spiracle nearer vent than snout 1.35-1.8; mouth 1.3-1.8 times in interorbital distance, average 1.5; width of body in its own length 1.25-1.7, average 1.47; belly deep cream color; tail green mottled with brown and covered with fine yellow spots. Egg mass, surface film.

Canada-Louisiana-Florida-New England. (Pl. 3, fig. 6.)---*Rana clamitans*.

- k*². Spiracle nearer vent than snout 1.07–1.45, averages 1.23–1.3; mouth 1.0–1.37 in interorbital distance, average 1.12.
- l*¹. Teeth $\frac{3}{2}$ or $\frac{1}{2}$; no inner papillae or few inner papillae from end of the upper fringe to the end of lower labial row; no row of finer papillae below third lower row of teeth; spiracle nearer eye than vent 1.1–1.75, average 1.43; nostril nearer eye than snout, 1.1–1.9, average 1.5; tadpoles (our material 42 mm.) medium; width of body in body length 1.6–2.0, average 1.77; second upper row $\frac{1}{2}$ to $\frac{3}{4}$ of the upper fringe; belly pure white or pale cinnamon pink; tail musculature with black clusters outlining cartridge buff areas; upper tail crest sometimes reticulated with black dots. Lower crest except for caudal half free of spots. Eggs unknown. Transformation size unknown.

Utah and Nevada. (Pl. 5, fig. 2.)----- *Rana onca*.

- l*². Teeth $\frac{3}{2}$ or $\frac{1}{2}$; four to six rows of inner papillae from end of upper fringe to end of lower labial row; a row of heavy inner papillae below the third lower row of teeth; spiracle nearer eye than vent 1.42–1.82, average 1.62; nostril nearer eye than snout; 1.0–1.42, average 1.2; width of body in body length 1.45–1.86, average 1.6; tadpoles large (92 mm.); second upper row $\frac{2}{5}$ or $\frac{1}{5}$ of the upper fringe or second upper row absent; belly pale chalcedony yellow, sulphur yellow, vinaceous, pale grayish vinaceous or vinaceous buff; tail: *upper tail crest with a black line or row of large black spots, more prominent than in R. grylio; middle of musculature with another black line, tail dark with pale chalcedony yellow spots.* Transformation size 25–35 mm.

Eggs a submerged mass.

New Jersey—Okefinokee Swamp, Georgia. (Pl. 5, fig. 1.)-- *Rana virgatipes*.

- d*². Papillary border on side of labium without an emargination; tadpoles 23–50 mm. length; labial teeth $\frac{3}{2}$ or $\frac{2}{2}$ ----- (Hylidae.)
- e*¹. Labial teeth $\frac{3}{2}$; eye dorsal just inside the lateral outline in dorsal aspect (more like Ranids); eye 1.0–1.66 (av. 1.22), nearer tip of snout than spiracle; depth of tail in length of tail 3.25–5.0, average 4.0; suborbital region oblique not vertical; spiracle to eye usually equal distance from spiracle to vent or base of hind legs; spiracle plainly showing from dorsum; *spiracular tube in life stands out at an angle from the body and opening is apart from the body proper*; tail tip conspicuously black (at times lost); papillary border does not extend above the end of the upper fringe (like *Rana*); length of horny beak in upper fringe of teeth 1.2–1.35 times; eggs single, rarely a mass.
- New York—Florida—Texas, up Mississippi Valley to Canadian Northwest. (Pl. 1, fig. 10)----- *Acris*.
- e*². Labial teeth usually $\frac{3}{2}$ (rarely $\frac{2}{2}$); eye lateral, visible from ventral as well as the dorsal aspect; eye 1.0–1.75 nearer the spiracle than tip of snout; depth of tail in length of tail 1.6–4.4, average 2.1–3.55; suborbital region vertical; spiracular tube in life parallel with body and opening at inner edge closely connected with or near to body proper.

Hylidae exclusive of *Acris*.

- f*¹. Labial teeth $\frac{3}{2}$.

- g*¹. Teeth normally $\frac{3}{2}$; tadpole to 23 mm.; spiracle 1.4–1.9 nearer base of hind legs or vent than tip of snout, average 1.42; nostril to eye 1.37–2.0 in nostril to snout, average 1.6; tail crests very clear with fine elongate fleckings; *tail musculature with black brown lateral band with light area below*; single row of papillae on lower labial border below second lower row of teeth; upper fringe somewhat angulate in middle (like *H. femoralis*);

median space between the second upper rows of teeth $4\frac{1}{2}$ to 5 in either lateral row; ends of second lateral row extending not at all or only slightly above the end of the upper fringe; horny beak about 1.5 in upper fringe.

Eggs irregular mass. (Pl. 1, fig. 11.)-----*Pseudacris* (Buffalo).

- g*². Teeth occasionally $\frac{2}{3}$; tadpole to 33 mm.; spiracle 2.0-2.6 nearer base of hind legs than tip of snout, average 2.16; nostril to eye 2.0 in nostril to snout; tail crests clear, heavily pigmented with purplish black blotches on the outer edge; no prominent dark lateral band with a clear light band below; upper fringe not perceptibly angulate in the middle; two rows of papillae on lower labial border below second lower row of teeth; median space between second upper rows of teeth 2-3 in either lateral row; ends of second lateral row extending $\frac{1}{4}$ to $\frac{1}{2}$; horny beak 1.75-2.25 in length from one end of lateral row to end of the other lateral row.

Eggs, single, submerged.

Manitoba-New Brunswick, South Carolina, Louisiana. (Pl. 4, fig. 1.)

Hyla crucifer.

- f*². Labial teeth $\frac{2}{3}$.

- g*¹. Third row of labial teeth short, shorter than horny beak or 0.20-0.40 of the first lower row in length; upper fringe slightly or not angulate at all; no flagellum ordinarily present; tadpoles 23-50 mm.; light papillary development, lower labial corner not with 3 or 4 strong rows of papillae; one or two rows of papillae below third lower row of teeth; the papillae extend above and beyond the end of the upper fringe for about 0.14-0.285 of the length of the upper fringe.

- h*¹. Tadpoles 23-33 mm.; eye equidistant between spiracle and tip of snout; spiracle 1.4-2.6 nearer vent or base of hind legs than tip of snout; spiracle 1.0-1.6 nearer eye than vent; papillae extend above the fringe for 0.16-0.25 of the length of the fringe.

- i*¹. *Musculature with no distinct brown lateral band with light area below*; crests usually heavily pigmented with purplish black blotches on outer rim; nostril to eye in nostril to snout 2.0; depth of tail in tail length 2.4-3.15, average 2.7; spiracle 2.0-2.6 nearer vent than snout, average 2.16; *no papillae below third lower labial row of teeth, thus appearing as a goatee*; median space between second upper labial row 2-3 in either lateral portion; horny beak in upper fringe 1.75-2.25.

Eggs single, submerged. (Pl. 4, fig. 1.)-----*Hyla crucifer*.

- j*². *Musculature with a distinct brown lateral band with light area below*; crests usually clear with fine scattered fleckings, sometimes with fleckings gathered nearer outer rim; one or two rows of papillae below the third lower labial row of teeth; nostril to eye in nostril to snout 1.25-2.0; depth of tail in tail length 2.9-4.4, average 3.4, 3.55; spiracle 1.15-2.1 nearer vent than snout, average 1.5-1.875; median space between second upper labial row $2\frac{1}{2}$ or 3-7 in either lateral portion; horny beak in upper fringe 1.5-2.0.

- j*¹. Dorsal crest to vertical of spiracle; spiracle 1.0-1.66 (average 1.33) nearer eye than vent; spiracle 1.15-1.95 (average 1.5) nearer vent than snout; mouth 1.0-1.25 larger than internasal space; two rows of papillae below third lower row of teeth; third labial lower row 0.25-0.33 of the first lower row; first and second lower labial rows 1.25-1.6 greater than the horny beak; horny beak in upper fringe 1.5-1.75; median space between second row of upper row $2\frac{1}{2}$ or 3-7 in either lateral portion. (Pl. 1, fig. 12.)

Pseudacris (Raleigh).

- j*². Dorsal crest to vertical midway between spiracle and eye; spiracle equidistant between eye and vent; spiracle 1.7-2.1 (average 1.875) nearer vent than snout; mouth and internasal space equal; one row of papillae below the

third lower row of teeth; third lower labial row of teeth 0.33 of the first lower row; *dorsum of body in life with definite scattered black spots*; musculature with three bands, apricot buff (light) chestnut brown (dark) martius yellow (light); first and second lower labial rows 2.0 greater than the horny beak; horny beak in upper fringe 2.0; median space between second row of upper labial teeth 3-4 in either lateral portion.

Eggs single.

South Carolina—Florida—Louisiana (Viosca). (Pl. 1, fig. 13.)

Pseudacris ocularis.

*h*². Tadpoles 35-50 mm.; eye 1.0-1.75 nearer spiracle than snout; spiracle 1.0-1.6 nearer vent than the tip of the snout; spiracle 1.25-2.5 nearer eye than vent or base of hind legs; papillae extend above the upper fringe for 1.4-0.285 of the length of the fringe.

*i*¹. Tadpoles 50 mm. in length; body in tail 2.3-3.25, average 2.5; depth of body in width of body 0.83-1.0, average 0.9; depth of tail 10-14 mm.; beautiful green tadpoles; young tadpoles with a black saddle spot on the back of the musculature near its base and with a light line from eye to tail; one row of papillae below lower third labial row; papillae extending above upper fringe for 0.25-0.285 of the fringe's length; dorsal crest extending to a vertical halfway between eye and spiracle.

Eggs single, submerged.

South Carolina—Florida—Louisiana (Viosca). (Pl. 4, fig. 2.)—*Hyla gratiosa*.

*i*². Tadpoles 35-45 mm.; body in tail 1.1-2.0, average 1.6; depth of body in width of body 1.0-1.8; depth of tail 5-9 mm.; no black saddle spot in young tadpoles.

*j*¹. Tadpole small (35 mm.); dorsal crest extending to vertical halfway between spiracle and the base of the hind legs; depth of tail in tail length 2.5-3.5, average 3.0; nostril to eye 1.2-2.1 in nostril to snout; mouth in interorbital space 1.33-2.6; internasal space in interorbital distance 1.33-2.2; eye just touches lateral axis or is below it; horny beak in upper fringe, 1.5-1.7; papillae extending beyond the end of the upper fringe 0.25-0.285 of the length of the upper fringe; two rows of papillae below third lower labial row; median space between second upper labial row 1.25-2.0 in either lateral portion; third lower labial row 0.20-0.22 of the first lower row; first row of lower labial teeth 1.0-1.5 times the horny beak. Eggs strewn in water amongst sphagnum (Noble and Noble).

New Jersey—South Carolina. (Pl. 4, fig. 3.)-----*Hyla andersonii*.

*j*². Tadpole medium (40 and 45 mm.). Dorsal crest extends ahead of spiracle or to eye; depth of tail in tail length 1.5-3.2, average 2.75; nostril to eye 1.0-1.7 in nostril to snout; mouth in interorbital space 1.4-2.0; internasal in interorbital space 1.25-2.0; eye on lateral axis; papillae extending beyond end of upper fringe 1.4-2.5 of the length of the upper fringe; median space in second upper labial row 3-5 in either lateral portion; third labial row 0.25-0.40 of the first labial lower row; first row of lower labial teeth 1.0-1.3 greater than the horny beak.

*k*¹. Dorsal crest to the vertical halfway between spiracle and the eye; depth of body in body length 1.7-2.5; musculature of tail in depth of tail 1.75-2.4, average 1.9; spiracle 1.4-2.3 nearer eye than vent; mouth 1.0-1.4 larger than internasal space, average 1.25; two rows of papillae below the third lower row of labial teeth; papillae extend beyond the end of the upper fringe 0.22-0.25 of the length of the fringe; horny beak in upper fringe 2.0-2.3; third labial lower row 0.25-0.40 the length of the first lower row.

Eggs surface or submerged irregular mass.

Virginia—Florida—Texas—Illinois. (Pl. 4, fig. 4.)-----*Hyla cinerea*

- k*². Dorsal crest extending to the vertical of the posterior edge of the eye; depth of body in body width 1.5–2.0; musculature in depth of tail 2.3–2.8, average 2.5; spiracle 1.6–1.75 nearer eye than snout; mouth 1.0–1.2 larger than internasal space; one row of papillae below the third lower labial row of teeth; papillae extend beyond the end of the upper fringe 0.14–0.20 of the length of the upper fringe; horny beak in upper fringe 1.4–1.8; third labial lower row 0.25–0.33 the length of the first lower row.

Eggs loose irregular mass.

Vancouver–Lower California, Nevada. (Pl. 4, fig. 5.)-----*Hyla regilla*.

- g*². Third row of labial teeth long, longer than horny beak, or 0.75–1.00 of the first lower row in length; upper fringe very angulate in middle; flagellum on tail; tadpoles 32–50 mm.; heavy papillary development, lower labial corner with three or four rows of papillae; two more or less complete rows of papillae below third row of teeth (except in *Hyla arenicolor*); papillae extend above and beyond the end of the upper fringe for about 0.30–0.40 the length of the upper fringe.
- h*¹. Third lower labial row 0.80–1.00 of the length of the first lower row; dorsal crest extends to the vertical halfway from hind legs to spiracle, to spiracle or halfway from spiracle to eye; dorsal crest equal to, greater or less than depth of tail musculature; tadpoles 36–50 mm.; red may be present in the tail; tail crest distinctly or more or less clear of spots next the musculature; tail heavily blotched with dark blotches or spots.
- i*¹. Medium space between lateral upper rows 5.0–10.0 times in either lateral row; spiracle 1.44–2.5 nearer eye than vent; width of body in its own length 1.6–2.1; eye 1.0–1.7 nearer spiracle than tip of snout; tail sometimes suffused with coral red, coral pink, or “reddish” or “orange.”
- j*¹. Medium space between lateral upper rows of teeth contained 6.0–10.0 in either lateral row; 1st and 2nd lower rows of teeth 1.4–1.6 greater than horny beak; mouth equal to internasal space; depth of tail in length of tail 1.6–2.75, average 2.25; muscular part of tail in depth of tail 1.8–2.3, average 2.1; depth of body 1.33–2.2 in body length, average 1.68; dorsal crest usually equal to or greater than musculature depth; center of belly solid sulphur yellow; tail 3–5 banded; light lateral band bounded below and above by a brown band; flagellum clear of pigment; body olivaceous black.

Eggs a surface film.

North Carolina–Florida–Texas. (Pl. 4, figs. 7, 9.)-----*Hyla femoralis*.

- j*². Medium space between lateral upper rows contained 5.0–10.0 times in either lateral row; first and second lower rows of teeth 1.5–2.0 greater than horny beak; third lower row of teeth may be equal to or slightly shorter than the first lower row; no or few papillae beneath the third lower row of teeth, surely not a complete row; mouth in internasal space 0.83–1.7, average 1.3; depth of tail in length of tail 2.85–5.15, average 3.75; musculature of tail in depth of tail 1.28–1.76, average 1.6; depth of body in body length 1.75–2.3, average 2.0; dorsal crest half way to or to vertical of the spiracle; dorsal crest less than the musculature; flagellum or tail tip spotted; body greenish olive or deep olive; center of belly solid pale cinnamon pink.

Western Texas (Devil's River, Fort Davis Mountains, etc.)–Utah, California, Mexico.

Eggs single, submerged (Atsatt and Storer). (Pl. 5, fig. 3.)--*Hyla arenicolor*.

- i*¹. Medium space between lateral upper rows contained 3.25–5.0 times in either lateral row; spiracle 1.12–1.5 nearer eye than vent; eye about equidistant between spiracle and tip of snout; internasal space in mouth 0.7–1.0; dorsal crest extends to vertical of spiracle or half way between eye and spiracle; dorsal crest equal to or greater than musculature depth; muscular part of

tail in depth of tail 1.72–1.9, average 1.8; depth of tail in length of tail 3.1–4.0; width of body in its own length 1.3–1.7; *no lateral bands in tail; tail more or less scarlet or orange vermillion with black blotches more prominent near the margins of the crests.* Bodies olive green; belly conspicuously white or very light cream.

Eggs a surface film.

Minnesota–Texas–Maine–Florida. (Pl. 4, fig. 8.)-----*Hyla versicolor*.

- h². Third labial lower row 0.75 of the length of first row; dorsal crest extends to the vertical of the posterior edge of the eye; dorsal crest usually less than depth of the musculature; tadpoles to 32 mm.; width of body in its own length 1.7–2.2, average 1.875; depth of tail in length of tail 2.2–3.3, average 2.8; third lower row of teeth not equal to first lower row; median space between lateral upper rows contained 3.25–5.0 times in length of either lateral row; papillae extends above and beyond the ends of the upper fringe for 0.3–0.33 of the upper fringe; horny beak in upper fringe 1.8–2.0; no bands nor red in tail; tail crest clear, *uniformly sprinkled with distinct black dots*; body greenish (like *H. cinerea* or *Hyla gratiosa*); belly testaceous, or chalcedony yellow.

Eggs single, submerged.

Texas–Indiana–Florida–Virginia. (Pl. 4, fig. 6.)-----*Hyla squirella*.

2. DESCRIPTION OF THIRTY-FOUR MATURE TADPOLES, MOSTLY FROM EASTERN AND SOUTHERN UNITED STATES

Each color description from life was made in the field. The topics of general appearance, mouth parts, relative measurements, and largest measurements are based on preserved material. Several species collected during the southwestern trips of 1917 and 1925, such as *Bufo compactilis*, *Bufo valliceps*, and *Bufo punctatus*, are not included.

GASTROPHRYNE TEXENSIS (Girard)

Plate 6, figure 3

Color description from life (May 27, 1925).—Dorsal parts citrine drab or grayish olive or light grayish olive or even deep grayish olive. In minute appearance the dorsum is smoke gray or a pale smoke gray. In fact, the tadpole sometimes in general looks drab. Hind legs, if developing, same colors as dorsum; with black or dark grayish olive cross bands on the toes; one or two bands on the tibia.

Belly.—Either side of middle for one-third to one-sixth inch is a clear line of pale grayish vinaceous or light vinaceous fawn. Between these lines the belly is light vinaceous purple. In chin region and lower belly pale pinkish cinnamon areolar areas more or less outlined by dots of black. Just ahead of the branchial pore two clear tillleul buff lines with considerable clear black between them.

Tail.—White or pale cinnamon pink band from body on musculature one-third inch or more in length, distinct, and in middle of musculature. Above and below tail musculature spotted smoke gray, or light grayish olive and black or citrine drab and black. Rest of

tail musculature almost clear citrine drab except for lower rim or edge. Most of dorsal crest and caudal tip at lower crest heavily spotted with large black spots and these on the outer half of the crest. Tail tip almost completely black. Space between black more or less colonial buff or sulphur yellow.

In *G. texensis*, tadpoles are grayish in cast, not so purplish or brownish as in *G. carolinensis*. Venter and side of belly with round light areas but not prominent stripes as in *G. carolinensis*. In alcohol, light bands on basal tail musculature on sides remain in *G. carolinensis*. There is no prominent bands of this sort or faintly so in *G. texensis* and in alcohol they are not apparent.

General appearance.—Tadpole small (23 mm.), flat, wide, less elliptical or round than that of *G. carolinensis*; snout less truncate than in *G. carolinensis*. Tail medium, obtuse or rounded, regularly with black tip. Dorsal or ventral crest not equal to musculature. The dorsal crest at least to the vertical of the developing hind legs. Spiracle median as in *G. carolinensis*. Anus median as in *G. carolinensis*. Eye on lateral axis but less so than in *G. carolinensis* and not so plainly visible from ventral aspect. Canthus more or less as in *G. carolinensis*. Muciferous crypts indistinct.

Mouth parts.—Teeth $\frac{0}{0}$. No horny mandibles; no labial teeth; no papillae; upper labial edge very black and emarginate in the middle. In *G. texensis* this edge is very much more black and prominent than in *G. carolinensis*. On the back of this edge appear little black excrescences or points not observed in *G. carolinensis*. In center of lower labium is a gray-colored median beaklike prolongation.

Measurements.—Length of body (10–11 mm.) in tail (12–15.4 mm.) 1.09–1.54, average 1.28. Width (6.0–7.5) of body in its own length 1.44–1.66, average 1.52. Depth (4.0–6.0) of body 1.25–1.75 in body width, average 1.49. Depth of body 1.83–2.47 in body length, average 2.26. Depth (3.6–4.4) of tail in length of tail 3.–3.5, average 3.3. Muscular part (2.8–3.4) 1.17–1.46 in depth of tail, average 1.29.

The dimensions of the largest tadpole are:

	Mm.		Mm.
Total length.....	25.0	Spiracle to vent.....	---
Body length.....	10.0	Spiracle to eye.....	---
Body depth.....	4.4	Eye to snout.....	3.0
Body width.....	6.0	Eye to nostril.....	---
Tail length.....	15.4	Nostril to snout.....	---
Tail depth.....	4.4	Mouth.....	4.0
Musculature of tail.....	3.0	Interorbital distance.....	4.0
Spiracle to snout.....	---	Internasal distance.....	---

GASTROPHRYNE CAROLINENSIS (Holbrook)

Plate 6, figure 1

Color description from life (July 7, 1921).—General color black, overlaid with very fine light purplish gray or quaker drab or hair-brown dots. Transverse stripe of belly divided in middle and apricot yellow or buff yellow in color. Along either side of belly a light buff stripe. Another such stripe on either side of the gill region. Sometimes whole venter with small light buff or pale orange yellow spots heaviest on belly and sides and lightest on throat. The interspaces are purplish gray, violet gray or plumbeous.

Tail with light buff or white stripe along middle or muscular part of tail. After the first one-half inch, the stripe breaks up into spots, which finally disappear caudally. Above and below this continuous stripe is clear black. Above this black is light purplish gray or quaker drab dots. Quaker drab not in lower crest. Lower and upper crests on caudal half with muscular part heavily blotched with black or rather light purplish gray or hair brown giving the tail tip almost a black appearance.

General appearance.—Tadpole small (26.4 mm.), flat, wide, elliptical, snout sometimes somewhat truncate. Tail medium, obtuse or rounded, sometimes with black tip. Dorsal and ventral crests not equal to depth of the musculature. The dorsal crest scarcely extends onto the body, reaching a vertical somewhat ahead of developing hind legs. Spiracle median, closely associated with anus, just ahead of it, not very apparent until hind legs begin to appear, when it becomes separated from the anus. Eye is on the lateral axis, distinctly lateral in position. From one eye to snout and around to the other eye the tadpole has a prominent canthus made by the flat ventral and dorsal sides of the head. Anus median at the end of the edge of the ventral crest. Muciferous crypts indistinct.

Mouth parts.—Teeth $\frac{0}{0}$. No horny mandibles; no labial teeth; no papillae; upper labial edge dark and quite emarginate in the middle; just below this emargination is a lower light-colored median beak like prolongation on the margin of the lower labium.

Measurements.—Length of body (9.2–10.8 mm.) in tail (9.8–16.4 mm.) 1.06–1.77, average 1.37. Width (6.8–8.0 mm.) of body in its own length 1.3–1.65, average 1.43. Depth (4.4–5.0 mm.) of body 1.35–1.65 in body width, average 1.5. Depth of body 2.0–2.3 in body length, average 2.15. Depth (3.2–5.0 mm.) of tail in length of tail 2.4–4.25, average 3.15. Muscular part (2.4–3.6 mm.) 1.16–1.66 in depth of tail, average 1.32. Spiracle just in front of vent. Nostril within lateral edge of mouth fold. Mouth (2.0–3.0 mm.) contained 1.5–2.25 (average 1.93) in interorbital distance (4.5–6.5 mm.).

The dimensions of the largest tadpole are:

	Mm.		Mm.
Total length.....	26.4	Spiracle to vent.....	---
Body length.....	10.0	Spiracle to eye.....	---
Body depth.....	4.8	Eye to snout.....	4.4
Body width.....	7.0	Eye to nostril.....	---
Tail length.....	16.4	Nostril to snout.....	---
Tail depth.....	5.0	Mouth.....	2.4
Musculature of tail.....	3.0	Interorbital distance.....	4.8
Spiracle to snout.....	---	Internasal distance.....	---

SCAPHIOPUS HOLBROOKII (Harlan)

Plate 6, figure 6

Color description from life (June 23, 27, 1922).—General appearance bronzy. Upper parts brownish drab, benzo brown, vinaceous drab. Upper parts with many close set spots of apricot orange or vinaceous tawny which on the top of upper tail crest become merged into a conspicuous bittersweet orange ridge of color. Throat and gill region with little of the orange vinaceous spots of upper parts. Gills can be seen through the skin. Spots on belly clear yellow green in places.

Tail.—Muscular part brownish drab, benzo brown, vinaceous drab. Crests translucent. Upper crest with thin edge of dots and interlacing lines. This arrangement goes around the tip. Rest of under crest translucent—no edging. On the caudal half of lower edge of the muscular part the muscle segments are more or less outlined by the light color making emarginations between the black dots. The same arrangement for the dorsal third of the muscular part of the tail.

Iris and eye black, small; eyes close together.

General appearance.—Tadpole small (28.0 mm.), broad, and large bodied but not deep. Body has from dorsal aspect a *Limulus*-like appearance. Tail short, tip blunt rounded. Body unlike *Bufo*, broader nearer eye than vent. Dorsal crest and ventral crests not deep nor greater than depth of musculature. Dorsal crest extends on to the body to a vertical just ahead of the developing hind legs, is perceptibly nearer hind legs than spiracle. Spiracle sinistral, far below lateral axis, as much or more ventral than lateral, opening more rectangular or slitlike than in our tadpoles in general. Spiracle about on the level of the mouth. Eye on the lateral axis (of tail musculature projected) very dorsal in position. The eyes close together, nearer the mid-dorsal axis than the lateral outline, in fact nearer together than in *Bufo*. Anus median at the end of the edge of the ventral crest. Muciferous crypts in preserved specimens at least indistinct.

Mouth parts.—Teeth $\frac{6}{6}$, $\frac{6}{5}$, $\frac{5}{6}$, $\frac{5}{5}$. Whole labium (upper and lower) with continuous row of papillae except on the upper labium where a pronounced median interval is toothed. This median row is about equal to the first lower labial row of either side. From upper labial interval of teeth downward either side and across the lower labial border there is at least one row of inner papillae. Opposite the ends of the horny beaks are several rows of them filling in the space between upper and lower labia. The next series of teeth (the second) below the upper toothed interval is usually not continuous rarely continuous. Usually one median end slightly overlaps the end of its counterpart of the other side. The third series has a short median interval one-half the distance of the upper toothed interval or first series or slightly more than a similar interval in the third lower labial series. Either half of the upper third series is slightly less in length than the horny beak and about equal to either half of the lower third series. Either half of the fourth series is longer than a similar half of the first lower labial series or shorter than that of the second series. The interval of this fourth row is about two-thirds the length of the horny beak or contained one and one-third to one and one-half times in the interval of the first lower labial series. The fifth series is a short lateral row about equal to the lateral row of second lower labial series. Beneath the fifth series and very closely placed to it is a short row almost opposite the end of the horny beaks. On the lower labium are five series, the first three not continuous, the last two continuous. The median interval of the first lower labial series is about equal to the horny beak in length. The interval of the second series is usually about equal to or less than the interval of fourth upper series. The interval of the third lower series is very short indeed, shorter possibly than the interval of the third upper series. The fourth continuous lower row is 1.6–1.7 times the horny beak in length. The fifth continuous lower row is 1.4–1.5 times in the fourth continuous lower row.

Measurements.—Length of body (10–12.2 mm.) in tail (12.8–17.6 mm.) 1.1–1.7, average 1.34. Width (6.0–7.4 mm.) of body in its own length 1.4–1.8, average 1.64. Depth (4.0–6.8 mm.) of body 1.03–1.50 in body width, average 1.23. Depth of body 1.73–2.5 in body length, average 2.04. Depth (3.4–5.4 mm.) of tail in length of tail 2.5–4.0, average 3.14. Muscular part (2.0–3.0 mm.) 1.45–2.5 in depth of tail, average 1.98. Spiracle 1.24–1.66 nearer base of hind legs or vent region (4.4–6.0 mm.) than the tip of the snout (7.0–8.0 mm.), average 1.41. Spiracle equidistant between eye (1.44–5.8 mm.) and base of hind legs or vent (14.4–6.0 mm.), average 1.0. Eye 1.4–1.8 nearer to tip of snout (3.0–3.6 mm.) than to spiracle (4.4–5.8 mm.) average, 1.52. Nostril 1.5–2.25 nearer eye (1.0–1.8 mm.) than snout

(2.0–3.0 mm.), average 1.9. Mouth (3.0–4.0 mm.) usually 1.66–2.5 larger than internasal space (1.2–2.0 mm.), average 2.08. Mouth usually contained 1.0–1.66 larger (average 1.3) than in interorbital distance (2.0–3.2 mm.). Internasal space contained in interorbital space 1.28–1.83, average 1.56.

The dimensions of the largest tadpole are:

	Mm.		Mm.
Total length.....	28.0	Spiracle to vent.....	6.0
Body length.....	12.0	Spiracle to eye.....	5.2
Body depth.....	5.0	Eye to snout.....	3.6
Body width.....	6.4	Eye to nostril.....	1.8
Tail length.....	16.0	Nostril to snout.....	2.4
Tail depth.....	4.4	Mouth.....	3.0
Tail musculature of.....	3.0	Interorbital distance.....	3.0
Spiracle to snout.....	7.6	Internasal distance.....	2.0

SCAPHIOPUS HAMMONDII Baird

Plate 6, figures 4, 5

Color description from life (July 12, 1925).—Back olive lake in general appearance. The belly color with black of back gives the olive lake or buffy citrine color. Back marbled with bright green yellow or light green and black giving general color above. Ahead of eye old gold appearance.

Tail.—Lower part and tip of tail musculature black. Top of cephalic half of musculature colored as the dorsum of body. A solid line of bright green yellow or light yellow green on top of musculature. Tail fins clear with rufous or bittersweet orange suffusion in parts and on the edges. Iris above and below pupil with half moon of lemon yellow; black vertical bar in front and behind pupil. Rest of eye black with dottings of bright green yellow. The tadpoles sometimes appear clay colored, or of vinaceous or buffy tints or very pale to pale olive buff or tilleul buff.

General appearance.—Tadpole large (65.0 mm.), broad, and not deep. Body from dorsal aspect is sometimes almost round. Dorsal and ventral sides of the front part of the body flatten out to a canthus-like edge in which the mouth seems, when not open, to be a mere slit. Tail medium to short; tail tip rounded. Dorsal and ventral crests about equal to depth of the musculature or sometimes less than it. The dorsal crest extends on to the body to a vertical ahead of the hind legs but not beyond the midway vertical between the hind legs and the spiracle. Spiracle very low, almost ventral, far below lateral axis and about on a level with mouth parts. Spiracular opening a long oblique slit directed backward and upward. Eye dorsal but on the lateral axis. Eyes close together, much nearer mid-dorsal line than lateral outline. Anus median, at the end of the edge of the ventral

crest. Muciferous crypts indistinct in preserved specimens. Sometimes the tadpoles do not grow big before transformation.

Mouth parts.—Teeth $\frac{4}{4}$, $\frac{3}{4}$, rarely $\frac{5}{4}$. Whole labium (upper and lower) with a continuous row of papillae except on the upper labium where a short median interval is toothed. This median row, unlike the tadpole of *S. holbrookii* is not equal to the first lower labial row of teeth, but is contained 1.5–2.9 times or more in this row. There is no inner row of papillae. The next row of teeth below the toothed interval is interrupted, the inner ends of this row seldom extending much below the ends of the toothed intervals unlike *S. holbrookii*, i. e., the median interval in the second row about equals the first row, or is slightly less. The third row has a wide median interval two to three times the first papillary toothed row. Either half of the third row is 0.4–0.3 times of the mandibular beak and about equal to the second lower labial row. Either one part of the fourth row is equal or sometimes twice the median interval of the second upper row. The fifth may be present on each side or absent on one side and present on the other, but usually is absent on each side.

On the lower labium are four series, the first three not continuous in the middle, the last continuous. The median interval of the first row is considerably less than the horny beaks and greater than the fourth series of teeth. The interval of the second series is usually about or less than that of the third upper row. The third lower series has a very slight median interval, less than the first dorsal row or the median interval of the second upper row. The fourth and last row is about equal to either lateral half of the upper second row or one half the length of the horny beak. Last row of teeth 1.75–2.0 in next to last lower row of teeth.

Measurements.—Length of body (17–28.0 mm.) in tail (23–37.0 mm.) 1.32–1.66, average 1.49. Width (12.6–18.0 mm.) of body in its own length 1.55–1.9, average 1.66. Depth (12–15.5 mm.) of body 1.05–1.15 in body width, average 1.09. Depth of body 1.6–2.0 in body length, average 1.79. Depth (10.6–15.5 mm.) of tail in length of tail 2.05–2.9, average 2.44. Muscular part (4.4–6.5 mm.) 2.25–2.66 in depth of tail, average 2.43. Spiracle 1.25–1.35 nearer base of hind legs or vent region (10–13 mm.) than the tip of the snout (13.0–17.5 mm.), average 1.30. Spiracle 1.25–1.6 nearer eye (7.8–10.5 mm.) than base of hind legs or vent, average 1.37. Eye 1.1–1.3 nearer to tip of snout (6.0–9.0 mm.) than to spiracle (7.8–10.5 mm.) 1.1–1.3, average 1.2. Nostril 1.4–2.5 nearer eye (2.0–2.0 mm.) than snout (4.0–6.0 mm.), average 2.05. Mouth (4.8–5.5 mm.) usually 1.8–2.5 larger than internasal space (2.0–3.0 mm.), average 2.25. Mouth contained 1–1.16 (average 1.08) in interorbital distance (5.0–5.6 mm.). Internasal space contained in interorbital space 2.5–2.75, average 2.6.

The dimensions of the largest tadpole are:

	Mm.		Mm.
Total length.....	65.0	Spiracle to vent.....	13.0
Body length.....	28.0	Spiracle to eye.....	10.5
Body depth.....	15.5	Eye to snout.....	9.0
Body width.....	18.0	Eye to nostril.....	3.0
Tail length.....	37.0	Nostril to snout.....	6.0
Tail depth.....	15.5	Mouth.....	5.5
Musculature of tail.....	6.5	Interorbital distance.....	5.5
Spiracle to snout.....	17.5	Internasal distance.....	3.0

SCAPHIOPUS COUCHII Baird

Plate 6, figure 7

Color description from life (June 5, 1925).—General appearance bronzy. Black everywhere, finely dotted with old gold, or light grayish vinaceous or vinaceous fawn or orange cinnamon. Some times all these colors are seen in the different angles of view or bright green yellow be added. Spots sometimes adjoin and form a vermiculation on dorsum. Entire underparts are spotted except around the spiracle. Spots less thick on cephalic third of venter. On the caudal two thirds, same spottings as on dorsum, yet intestine shows through the skin.

Tail.—Upper half of musculature spotted, some of the lower half and tail tip free of spots. Upper and lower tail crests transparent.

Iris black with spots or dots of the above colors described for dorsum of body.

General appearance.—Tadpole small (24.5 mm.), broad, head possibly more pointed than tadpole of *S. holbrookii*. Tail shorter than in *S. holbrookii*, tip blunt, rounded. Dorsal and ventral crests as deep as or greater than musculature. Dorsal crest extends on to the body to a vertical as near spiracle as vent or nearer spiracle. Spiracle low, almost ventral, more lateral than in *S. holbrookii*. Eyes dorsal, close together, as near mid-dorsal line as lateral outline. Anus median at the end of the edge of the ventral crest. Muciferous crypts in preserved specimens at least indistinct.

Mouth parts.—Teeth, $\frac{2}{4}$, usually $\frac{4}{4}$, rarely $\frac{5}{4}$, $\frac{3}{6}$ or $\frac{5}{5}$. Whole labium with a continuous row of papillae or inconspicuously broken in the middle of upper labium; inner papillae scarce. First row of teeth very short, or absent; the second row of upper teeth continuous in middle some times barely broken in middle; the third upper row has a wide median interval 2–3 times the first papillary toothed row. A fifth upper row may be present on each side or only one side.

On the lower labium are usually four series of teeth, the first two not continuous in the middle, the last two continuous. The interval of second row is very short; last lower row of teeth 2.5–3 times in next to

last row. Sometimes above the normal first row may occur a fifth series.

Measurements.—Length of body (10–11 mm.) in tail (14–15.5 mm.) 1.3–1.5, average 1.4. Width (7.0–8.5 mm.) of body 1.3–1.6 in its own length (10–11 mm.), average 1.4. Depth (5.4–6.0) of body, 1.25–1.55 in body width, average 1.35. Depth of body 1.66–2.0 in body length, average 1.9. Depth (5.0–6.0) of tail in length of tail 2.5–2.9 average 2.65. Muscular part (1.8–2.5), 2.2–3.33 in depth of tail, average 2.7. Spiracle 1.16–1.6 nearer tip of snout (5.0–6.0) than base of hind legs or vent (6.0–8.0) average 1.3. Spiracle 1.5–2.2 nearer eye (3.2–4.5) than base of hind legs or vent (6.0–8.0), average 1.85. Eye 1.0–1.6 nearer to tip of snout (2.8–3.4) than to spiracle (3.2–4.5) average 1.3. Nostril 1.4–2.2 nearer eye (1.0–1.6) than snout (2.18–3.4) average 1.85. Mouth (2.4–2.8) usually 1.5–2.15 larger than internasal space (1.2–1.6) average 1.85. Mouth contained 1.0–1.33 average 1.12 in interorbital distance (2.0–3.2). Internasal space contained in interorbital space 1.45–2.3, average, 2.0.

The dimensions of the largest tadpole are:

	Mm.		Mm.
Total length.....	24.5	Spiracle to vent.....	6.0
Body length.....	11.0	Spiracle to eye.....	4.0
Body depth.....	5.5	Eye to snout.....	3.0
Body width.....	8.5	Eye to nostril.....	1.0
Tail length.....	14.5	Nostril of snout.....	2.2
Tail depth.....	5.0	Mouth.....	2.6
Musculature of tail.....	2.0	Interorbital distance.....	3.0
Spiracle to snout.....	6.0	Internasal distance.....	1.4

BUFO TERRESTRIS Bonnaterra

Color description from life (July 7, 1921).—General color is black with scattered dots, which are pale purplish vinaceous. Venter black with few scattered light purplish vinaceous spots, but not clustered to make one continuous mass of color as on the belly of *B. quercicus*.

Tail.—Upper crest spotted, but not so strongly as in *Bufo quercicus*. Lower crest almost clear of spots. Lower edge of muscular part white or light chalcedony yellow.

General appearance.—Body small (26 mm.), ovoid, broader nearer vent than eyes. Dorsal aspect shows body decidedly tapers ahead of the eyes. Dorsel crest low, extends but slightly on to the body to a vertical just ahead of the buds of the hind legs. Dorsal and ventral crests about equal and about equal to the depth of the musculature. Tail short, tip rounded. Spiracle sinistral, directed mainly backward, somewhat upward, below the lateral axis. Eye above lateral axis. Eyes dorsal, close together, slightly nearer lateral outline than mid-dorsal line. Anus median, opening in a level lower

than the lower edge of the ventral crest. Muciferous crypts indistinct.

Mouth parts.—Teeth $\frac{2}{3}$. Upper labium fringed with a continuous row of labial teeth, the papillae extending only to each end of this fringe. The end of the second upper row does not extend beyond the end of the upper fringe. The median space between the two parts of the second row is contained 1.4–2.1 times the lateral row. Horny beak about equal to or slightly less than the third lower labial row of teeth or contained 1.75 times in the upper fringe, or about 1.5 times the first or second row of lower labial teeth, which are about equal. The third row of lower labial teeth may be contained 1.2–1.4 times in the length of the second or first lower lateral row. Rows of papillae at least two, very prominent, sometimes 3–5 rows at corner of mouth. Lower loop of papillary border very prominent with at least two distinct rows of papillae. This loop sometimes extends slightly beneath the end of the third row of teeth. This loop decidedly lower in level than end of the third labial lower row.

Measurements.—Length of body (8.0–9.8 mm.) in tail (9.0–15.0 mm.) 1.05–1.66, average 1.3. Width (5.2–7.0 mm.) of body in its own length 1.36–1.74, average 1.51. Depth (3.6–5.0 mm.) of body 1.22–1.6 in body width, average 1.36. Depth of body 1.86–2.25 in body length, average 2.07. Depth of tail (2.4–5.0 mm.) in length of tail 2.4–4.5, average 3.27. Muscular part (1.4–2.2 mm.) 1.5–3.0 in depth of tail, average 2.11. Spiracle 1.0–2.0 nearer base of hind legs or vent region (3.6–6.0 mm.) than the tip of the snout (4.8–7.4 mm.), average 1.51. Spiracle 1.0–1.53 nearer eye (2.8–4.4 mm.) than base of hind legs or vent, average 1.26. Eye 1.0–1.57 nearer to tip of snout (2.6–3.8 mm.) than to spiracle (2.8–4.4 mm.), average 1.19. Nostril 1.1–1.8 nearer eye (1.0–1.8 mm.) than snout (1.6–2.6 mm.), average 1.48. Mouth (2.0–2.8 mm.) usually 1.2–1.6 larger than internasal space (1.6–2.4 mm.), average 1.36. Mouth contained 1.00–1.5 (average 1.17) in interorbital distance (2.0–3.4 mm.). Internasal space contained in interorbital space 1.1–2.1, average 1.56.

The dimensions of the largest tadpole are:

	Mm.		Mm.
Total length.....	24.0	Spiracle to vent.....	4.5
Body length.....	9.8	Spiracle to eye.....	4.0
Body depth.....	5.0	Eye to snout.....	3.0
Body width.....	7.0	Eye to nostril.....	1.4
Tail length.....	14.2	Nostril to snout.....	2.2
Tail depth.....	4.8	Mouth.....	2.8
Musculature of tail.....	1.6	Interorbital distance.....	3.4
Spiracle to snout.....	6.8	Internasal distance.....	2.0

BUFO AMERICANUS Holbrook

Plate 6, figure 12

*Color description from life (not Ridgway).—*The ground color is a very dark brown or black overlaid with many fine gold and silvery spots, these aggregated in a few places. The venter is like the back, but the aggregate of bright spots are more silvery and more or less iridescent (coppery). The muscular portion of the tail is dark, like the back, with a few gold-spotted areas. The crests are *cloudy transparent*.

*General appearance.—*Body small (27 mm.), ovoid, broader nearer vent than eyes. Dorsal aspect shows body decidedly tapers ahead of eyes. Dorsal crest low, extends but slightly on to the body to a vertical just ahead of the buds of the hind legs. Dorsal and ventral crests about equal to depth of the musculature. Tail short, tip rounded. Spiracle sinistral, directed mainly backward but slightly upward, considerably below the lateral axis. Eye above the lateral axis. Eye quite dorsal, more or less closely together slightly nearer lateral outline, but almost equidistant between lateral outline and mid-dorsal line. Anus median, opening on a level lower than the lower edge of the ventral crest.

*Mouth parts.—*Teeth $\frac{2}{3}$. Upper labium fringed with a continuous row of labial teeth, the papillae extending only to each end of this fringe. The end of the second upper row does not usually extend beyond the end of the upper fringe. The median space between these two lateral parts of the second row is contained in either lateral row of teeth 1.15–2 times normally (1.0 or 3–4 times). The horny beak is contained about 1.2–1.4 in upper fringe or almost as long as first or second lower labial row of teeth. First and second lower labial rows of teeth equal and about 1.1 to 1.2 times longer than horny beak. Third row of lower labial teeth is contained about 1.3–1.5 times in the first or second lower labial row. Papillary border of weak papillae (as compared with *B. terrestris*). Lower loop of papillae not pronounced as in *B. terrestris*. One row of papillae from upper fringe to lower third labial row except for a few scattering papillae.

*Measurements.—*Length of body (7.0–10.2 mm.) in tail (11.1–17.6 mm.) 1.3–1.7, average 1.49. Width (4.2–7.4 mm.) of body in its own length 1.25–1.7, average 1.52. Depth (3.2–5.6 mm.) of body 1.26–1.56 in body width (4.8–7.4 mm.), average 1.35. Depth 2.4–5.0 mm.) of tail in length of tail 1.25–2.7, average 1.97. Muscular part (1.4–2.6 mm.) 1.26–2.66 in depth of tail, average 2.04. Spiracle 1.3–1.8 nearer base of hind legs or vent region (2.8–5.4 mm.) than the tip of the snout (4.4–7.4 mm.), average 1.54. Spiracle 1.04–1.54 nearer eye (2.0–4.0 mm.) than base of hind legs or vent (2.8–5.4

mm.), average 1.28. Eye 1.0–1.27 nearer to tip of snout (2.2–3.4 mm.) than to spiracle (2.0–4.0 mm.), average 1.16. Nostril nearer eye than snout. Mouth (1.8–2.6 mm.) usually 1.4–2.2 larger than internasal space (1.0–1.5 mm.), average 1.76. Mouth contained 0.77–1.0 (average 0.92) in interorbital distance (1.8–2.4 mm.). Internasal space contained in interorbital space 1.3–1.8, average 1.6.

The dimensions of the largest tadpole are:

	Mm.		Mm.
Total length.....	27.8	Spiracle to vent.....	4.8
Body length.....	10.2	Spiracle to eye.....	4.0
Body depth.....	5.6	Eye to snout.....	3.4
Body width.....	7.4	Eye to nostril.....	---
Tail length.....	17.6	Nostril to snout.....	---
Tail depth.....	5.0	Mouth.....	2.4
Musculature of tail.....	2.4	Interorbital distance.....	2.4
Spiracle to snout.....	7.4	Internasal distance.....	1.4

BUFO from Raleigh, N. C.

Plate 1, figure 8

General appearance.—Body small (27 mm.), ovoid, greatest width nearer the vertical of the vent than that of the eyes. Dorsal crest low, extends onto the body slightly, to a vertical just ahead of the hind legs. Dorsal and ventral crests about equal, and about equal in depth to tail musculature. Spiracle sinistral, directed mainly backward, somewhat upward, below lateral axis. Eye just above lateral axis. Eyes dorsal close together slightly nearer lateral outline than mid-dorsal line. Anus median, opening on or slightly below the lower edge of lower crest. Muciferous crypts indistinct.

Mouth parts.—Teeth $\frac{2}{3}$. Upper labium fringed with a continuous row of labial teeth, the papillae extending only to each end of the upper fringe. The end of the second upper row of teeth does not extend beyond the end of the upper fringe. The median space between the two parts of the second row is contained 1.3–3.0 times in either lateral row. Horny beak contained 1.4–1.5 times in the upper fringe 1.2–1.3 times in first or second lower labial row of teeth and slightly larger than the third row. The third row is contained 1.3–1.6 times in the first lower row. One row of papillae from end of upper fringe to end of third lower row of teeth. On lower loop at end of third lower row only two or three scattering inner papillae. This loop of papillae extends slightly underneath the end of the third row as in *B. terrestris*. The papillary border in general is more like that of *B. americanus*.

Measurements.—Length of body (8.4–11.0 mm.) in tail (12.4–17 mm.) 1.2–1.7, average 1.43. Width (5.6–6.4 mm.) of body in its own length 1.4–1.77, average 1.62. Depth (4.0–5.0 mm.) of body 1.2–1.5 in body width, average 1.3. Depth of body 1.75–2.35 in

body length, average 2.12. Depth (4.0–6.0 mm.) of tail in length of tail 2.88–3.83, average 3.33. Muscular part (2.0–2.6 mm.) 1.60–2.30 in depth of tail, average 1.85. Spiracle 1.1–1.5 nearer base of hind legs or vent region (4.2–5.8 mm.) than the tip of the snout (6.0–7.0 mm.). Spiracle 1.25–1.7 nearer eye (3.2–3.8 mm.) than base of hind legs or vent, average 1.45. Eye 1.0–1.6 nearer to tip of snout (3.0–3.6 mm.) than to spiracle (3.2–3.8 mm.) average 1.16. Nostril 1.4–2.75 nearer eye (0.8–1.6 mm.) than snout (1.4–2.2 mm.) average 1.9, mouth (2.0–2.6 mm.), usually 1.1–1.83 larger than internasal space (1.2–2.0 mm.), average 1.47. Mouth contained 1.07–1.5 (average 1.07–1.5) in interorbital distance (2.6–3.6 mm.). Internasal space (1.4–2.0 mm.) contained in interorbital space 1.5–2.16 average 1.86.

The dimensions of the largest tadpole are:

	Mm.		Mm.
Total length.....	27. 0	Spiracle to vent.....	5. 4
Body length.....	10. 0	Spiracle to eye.....	3. 8
Body depth.....	4. 8	Eye to snout.....	3. 2
Body width.....	6. 2	Eye to nostril.....	1. 0
Tail length.....	17. 0	Nostril to snout.....	2. 0
Tail depth.....	6. 0	Mouth.....	2. 6
Musculature of tail.....	2. 6	Interorbital distance.....	2. 8
Spiracle to snout.....	6. 8	Internasal distance.....	1. 6

BUFO QUERCICUS Holbrook

Plate 6, figure 8

Color description from life (July 7, 1921).—General coloration of the body is grayish olive, olive lake, grape green, or ecru olive, produced by close set dots of lighter color over a blackish background. Very few small black spots on the back. In one two-legged specimen general color quaker drab or of the vinaceous group. There is a black spot over the nostril and one over each eye. The belly is pale purplish vinaceous; the throat and mentum with no bright color. Gill region with clusters of deep olive buff or the general colors above.

Tail.—The upper crest much more heavily marked than in *Bufo terrestris*. Lower crest is also more or less marked with black. Along the dorsum of the muscular part of the tail are six or seven black saddles. Along the ventral edge of muscular part are small black clusters but not so prominent as dorsal saddles. In a two-legged specimen alternation of dark and light on tail musculature for eight or nine spots. Along the back of body proper the characteristic paired spots (four or five of them) appear.

Iris black and general colors above.

RANA SYLVATICA LeConte

Plate 7, figure 4

Color description from life (not Ridgway).—Background of back and sides greenish black marked with fine gold and with a few orange spots; also with iridescent areas, particularly on the sides, giving the whole a greenish brown appearance. A cream line extends along the upper jaw. The venter has a cream ground; belly slightly pigmented at the sides; gill region quite heavily pigmented, but overlaid with silver spots; throat region a lavender gray with fine dark and silver spots, the whole venter iridescent, giving the belly a distinct pinkish bronze appearance. Iris of eye bronze. Tail somewhat lighter than body, the pigment graded evenly over the muscular portion and crests, but as a whole darker above; small gold spots are scattered over the surface, some of which become iridescent.

General appearance.—Tadpole medium (49.8 mm.), full, and deep bodied. Venter not strongly pigmented. Tail quite long, tip decidedly acuminate or attenuate. Dorsal crest very high, greater than width of musculature and extending on to body to the vertical through the spiracle, more in this respect like our *Hyla* tadpoles. Ventral crest as well developed as dorsal crest. Spiracle sinistral and directed upward and backward, distinctly below lateral axis. Eye on lateral axis, almost on the lateral outline in dorsal aspect and farther from mid-dorsal axis than any other eastern Ranid. Eyes just visible from venter. Anus dextral, opening on the level of the edge of the ventral crest. Muciferous crypts indistinct.

Mouth parts.—Teeth $\frac{3}{4}$. Upper labium with a fringe on its upper edge, this fringe much longer than the beak (about one and one-half times beak). The second row of lateral upper labial teeth is very long, is about two-fifths of the upper fringe. The median space is usually two-fifths to four-fifths of the length of one of the lateral rows. The end of the second lateral row often extends beyond the end of the upper fringe. The third upper labial row is usually about one-half of the length of the second row or one-fourth or two-ninths of the length of the upper fringe. The lower labium has four rows of teeth. The first three are of about equal length, and these are longer than the beak. The fourth row of labial teeth is about equal to the single row of lower labial papillae. The fourth row is six-elevenths to seven-elevenths of the first row of lower labial teeth. The labium on either side with inner papillae to the end of the four lower labial row.

Measurements.—Length of body (14.4–17.2 mm.) 1.5–2.2 in tail (23.8–33.2 mm.), average 1.8. Width (9.4–12.6 mm.) of body in its own length 1.3–1.58, average 1.41. Depth of body 1.08–1.23 in body width, average 1.14. Depth of body 1.66–2.0 in length of body,

average 1.78. Depth of tail 1.9–3.1 in length of tail, average 2.5. Muscular part (4.2–6.4 mm.) 1.75–2.8 in depth of tail (10.0–13.8 mm.), average 2.47, rarely below 2.0. Spiracle 1.5–2.0 nearer base of hind legs or vent region, (5.4–7.6 mm.) than the tip of the snout (10.4–12.4 mm.), average 1.73, rarely reaching 2.0 or under 1.7. Spiracle 1.0–1.48 nearer eye (5.0–6.0 mm.) than base of hind legs or vent (5.4–7.6 mm.), average 1.18. Eye equidistant, sometimes nearer to tip of snout (4.6–6.0 mm.) than spiracle (5.0–6.0 mm.). Nostril equidistant from snout and eye (2.8–3.6 mm.). Mouth (2.0–3.8 mm.) usually 1.1–1.9 larger than internasal space (1.8–3.0 mm.), average 1.72. Mouth contained 1.36–2.0 average 1.62 in interorbital distance (5.0–6.4 mm.). Internasal space contained in interorbital space 1.7–2.9, average 2.5, seldom under 2.0.

The dimensions of the largest tadpole are:

	Mm.		Mm.
Total length.....	49.8	Spiracle to vent.....	7.6
Body length.....	16.6	Spiracle to eye.....	5.4
Body depth.....	13.8	Eye to snout.....	5.4
Body width.....	12.6	Eye to nostril.....	2.8
Tail length.....	33.2	Nostril to snout.....	2.8
Tail depth.....	10.6	Mouth.....	3.4
Musculature of tail.....	5.0	Interorbital distance.....	5.0
Spiracle to snout.....	11.8	Internasal distance.....	2.0

RANA BOYLI SIERRAE Camp

General appearance.—Tadpole fairly large (72 mm.), body flatter than most Ranid tadpoles. It is distinctive in that the tail musculature is wide and keeps the same width for an inch or an inch and one quarter and then suddenly tapers off. Tail very long, tip very bluntly rounded. The crests are broader back near the tail tip than nearer the insertion on the body. The rear half of the tail might be termed elliptical in outline, or the tail tip might tend toward a spatulate tail. The broadest part of the tail comes where the musculature finally begins to taper. The dorsal crest is very narrow forward and extends on to the body to a vertical twice as near the buds of the hind legs as the spiracle. Spiracle sinistral, below lateral axis, decidedly upturned and somewhat backward in direction, with a prominent round or elliptical pore very evident.

Anus dextral, opening on a level with the edge of the ventral crest. Muciferous crypts distinct. In preserved material they look like brown or black pigment spots not white as in *R. hecksheri* or some other Ranid species. On either side of dorsal crest for a distance back of its body insertion there extends a row of crypts which go diagonally outward on the body and finally joins the main dorso-lateral series which starts from the mid-lateral insertion of the tail musculature on the body. This lateral series travels to back of the

eye where the supraorbital branch goes over eye and above nostril on to snout above the mouth. This same lateral branch sends off an infraorbital branch which in front of the eye swings far downward away from the nostril and ends near the corner of the tadpole mouth. Just back of the eye the infraorbital branch sends a loop upward and then abruptly downward to the venter where it goes forward as a mandibular branch to the mouth. Another lateral series low on the body runs evenly forward until it loops over the spiracle.

Mouth parts.—Teeth $\frac{3}{4}$. The teeth are after the *R. sylvatica* type. Occasionally in some of the young forms it may be two-four or rarely two-three. The upper labium is fringed with a row of teeth much larger than the beak (about one and one-half times the beak). The second row of lateral teeth is of medium length, is about one-fourth to two-ninths of the length of the upper fringe. The median space between this second row of upper labial teeth is one to two and three-tenths times the length of either lateral row. The third upper labial row is about one-half of the length of the upper fringe. The lower labium has four rows of teeth, the first two about equal and sometimes the third also equal to the other two or slightly shorter. The first row often subdivided and sometimes the second row. The fourth row is equal to the single row of lower labial papillae, is one-third or one-half to four-ninths the length of the first lower row. Inner papillae on side of labium extend to the end of the fourth lower labial row of teeth.

Measurements of average tadpole.—Length of body (16–23.5 mm.) in tail (6.0–11.0 mm.) 1.36–2.05, average 1.60. Width (9.5–15.0 mm.) of body in its own length 1.45–1.85, average 1.63. Depth (7.0–11.0 mm.) of body 1.1–1.8 in body width, average 1.43. Depth of body 2.0–3.0 in body length, average 2.325. Depth (6.0–11.0) of tail in length of tail 2.5–5.7, average 3.93. Muscular part (3.5–6.0 mm.) 1.33–3.0 in depth of tail, average 2.0. Spiracle 1.0–1.33 nearer base of hind legs or vent region (9.0–12.0 mm.) than the tip of the snout (9.5–14.0 mm.), average 1.17. Spiracle 1.45–2.375 nearer eye (4.0–8.0 mm.) than base of hind legs or vent (5.8–12.0 mm.), average 2.05. Eye 1.875–1.33 nearer to tip of snout (30–6.0 mm.) than to spiracle (4.0–8.0 mm.), average 1.11. Nostril 1.0–1.75 nearer eye (2.0–3.0 mm.) than snout (3.0–4.0 mm.), average 1.32. Mouth (3.0–4.0 mm.) usually 1.08–1.75 larger than internasal space (2.0–3.5 mm.), average 1.33. Mouth contained 1.0–1.7 (average 1.17) in interorbital distance (3.0–6.0 mm.). Internasal space contained in interorbital space 1.3–2.0, average 1.53.

The dimensions of the largest tadpole are:

	Mm.		Mm.
Total length.....	72.0	Spiracle to vent.....	11.5
Body length.....	23.5	Spiracle to eye.....	8.0
Body depth.....	11.0	Eye to snout.....	6.0
Body width.....	15.0	Eye to nostril.....	2.6
Tail length.....	48.5	Nostril to snout.....	4.0
Tail depth.....	8.5	Mouth.....	3.8
Musculature of tail.....	5.6	Interorbital distance.....	4.5
Spiracle to snout.....	14.5	Internasal distance.....	3.5

RANA AESOPUS (Cope)

Plate 7, figure 1

Color description from life (August 1, 1922).—At times the tadpole has a very greenish cast. Color on top of the head oil yellow, olive yellow, olive lake or old gold ahead of level of eyes. Back of eye level yellowish citrine or olive citrine where there are no black spots.

About four irregular series of black spots between lateral line series of spots of either side. Lateral line pores closely set and lateral line canal distinct to the tip of the tail. A dark spot on each upper eyelid. A dark spot or spots in interorbital space. Top of head ahead of eye with several fairly large spots. Spots most distinct and numerous from nostril to base of muscular part of the tail, being on the sides interspersed with light pinkish cinnamon or pinkish buff. This color is present on muscular tail and slightly on upper and lower crests as small clusters. This light pinkish cinnamon or pinkish buff merges into the block color of the belly which is cream-buff, colonial buff, or naples yellow. This block color breaks up in gill or branchial region becoming clusters of fine dots or spots. Below eye to either side of branchial region is some light vinaceous cinnamon or vinaceous fawn. Middle of branchial region without this color. Mental region without these colors but with a slight fine dark specking of black lines.

Background color of the tail mignonette green. Upper crest and muscular part with large spots of black. Lower crest without large distinct spots except at the tip.

Iris rim around pupil orange or cadmium orange to light cadmium. Rest of iris black with mignonette green or apple green fine dots.

General appearance.—Tadpole large (84.0 mm.), full, and deep-bodied. Venter strongly pigmented so that viscera do not show through in life or in preserved condition. Tail long, tip obtuse or acute. Dorsal crest in depth sometimes equal to or greater than the depth of the musculature and extending on to body somewhat ahead of the vertical of the buds of the hind limbs. Spiracle sinistral, directed upward and backward. Spiracle distinctly below the lateral axis. Eye above or slightly on lateral axis, and near lateral outline

in dorsal aspect than mid dorsal line. Muciferous crypts distinct. The dorsal row from either side of the insertion of the dorsal crest extends obliquely forward and outward to join the principal lateral row which extends from above the middle of the tail musculature to back of the eye. Here it forks, sending a supraorbital branch far past the nostril to snout and an infraorbital branch also to the snout and quite far below the nostril in its course. Below the principal lateral series is a lower one on side around the spiracle but forward it is not very distinct.

Mouth parts.—Teeth $\frac{2}{3}$. Edge of upper labium slightly larger than beak and fringed with teeth. In either corner a row of teeth about one-third to one-fourth of the upper fringe. The outer end of this lateral row usually (abnormal in figure in this regard) does not extend beyond the end of the upper fringe. The median space between lateral rows is one to two times either row, nearer the condition in *R. pipiens*. The third lower row about equal or slightly larger than single row of lower labial papillae, one-third to two-sevenths shorter than first or second rows which are equal and larger than the beak. The tadpole is clearly of the *R. pipiens* or *R. sphenocephala* type.

Measurements.—Length of body (28–33.5 mm.) in tail (74–81 mm.) 2.15–2.85, average 2.62. Width (13.5–19 mm.) of body in its own length 1.6–2.07, average 1.8. Depth (12–15 mm.) of body 0.88–1.7 in body width, average 1.14. Depth of body 1.5–2.4 in body length, average 2.01. Depth (10–18.5 mm.) of tail in length of tail 2.6–3.5, average 3.05. Muscular part (6–9 mm.) 1.45–1.9 in depth of tail, average 1.75. Spiracle 1.1–1.7 nearer base of hind legs or vent region (14–16.5 mm.) than the tip of the snout, average 1.36. Spiracle 1.4–2.0 nearer eye than base of hind legs or vent, average 1.55. Eye 1.0–1.3 nearer to spiracle (5.0–7.0 mm.) than tip of snout (6–9 mm.), average 1.12. Nostril 1–1.5 nearer eye (2.5–5.0 mm.) than snout (3.0–6.0 mm.), average 1.25. Mouth (3.0–5.0 mm.) usually 0.84–1.26 larger than internasal space (2.8–5.0 mm.), average 1.06. Mouth contained 1.25–1.66 (average 1.5) in interorbital distance (4.5–8.0). Internasal space contained in interorbital space 1.3–1.9, average 1.57.

The dimensions of the largest tadpole are:

	Mm.		Mm.
Total length.....	81.0	Spiracle to vent.....	14.0
Body length.....	29.0	Spiracle to eye.....	7.0
Body depth.....	14.0	Eye to snout.....	9.0
Body width.....	15.0	Eye to nostril.....	4.0
Tail length.....	53.0	Nostril to snout.....	6.0
Tail depth.....	15.0	Mouth.....	5.0
Musculature of tail.....	8.0	Interorbital distance.....	8.0
Spiracle to snout.....	17.0	Internasal distance.....	4.2

RANA PALUSTRIS LeConte

Plate 7, figure 2

Color description from life (not Ridgway).—Background of body olive green, shading through yellowish on the sides and front of head to cream on the venter, the back being marked with fine black and yellow spots. The yellow is more marked at the base of the tail and in the region of the mouth. Blotches of white pigment occur on the belly. From the gill region forward, black as well as white pigment is prominent. The whole venter is conspicuously iridescent. The tail is very dark, particularly toward the tip the whole marked with fine black and golden-yellow punctulations, the yellow ones usually aggregate; these groups of yellow spots are more numerous toward the base of tail. In some specimens the dark punctulations are so numerous as to make the tail *purplish black*, a condition (when present) making these tadpoles almost as distinctive as the vermilion-tailed tadpoles of *Hyla versicolor* class.

General appearance.—Tadpole large (76 mm.), full, and deep bodied. Venter not strongly pigmented so that viscera show through, at least in preserved specimens. Tail medium, tip obtuse or acute. Dorsal crest not equal in depth to musculature depth, and extending on to body somewhat ahead of the vertical through the buds of the hind legs. Spiracle sinistral, directed upward and backward, slightly below the lateral axis. Eye on or just above the lateral axis and near the lateral outline in dorsal aspect than the mid dorsal line. Anus dextral, the opening on a level with the edge of the ventral crest. Muciferous crypts present.

Mouth parts.—Teeth $\frac{2}{3}$, rarely $\frac{1}{3}$. Edge of upper labium longer than beak and fringed with teeth. In either corner a row of teeth one-fifth to 1.7 of the upper fringe, the outer end of this lateral row not extending beyond the end of the upper fringe. The median space between lateral rows two to four times the length of the lateral row. The second upper labial row or the lateral one, so called, is sometimes absent or faint on both sides or on one side. The first lower labial row sometimes subdivided. The third lower row slightly shorter than the single row of lower papillae, two-thirds to one-third (usually about one-half) shorter than the first or second rows, which are about equal and which are about equal to or slightly larger than the beak.

Measurements.—Length of body (19.2–25.6 mm.) 1.4–1.9 in tail, average 1.6. Width (11.8–18.0 mm.) of body in its own length 1.4–1.85, average 1.6. Depth (10–14.2 mm.) of body 1.07–1.26 in body width, average 1.15. Depth of body 1.69–1.92 in length of body, average 1.83. Depth of tail in length of tail 2.3–3.2, average 2.7.

Muscular part 1.8–2.2 in depth of tail, average 2.0. Spiracle 1.2–1.9 nearer base of hind legs or vent region than the tip of the snout, average 1.6. Spiracle (5.2–6.4 mm.) nearer eye than 1.5–1.8 base of hind legs or vent (9–10.2 mm.), average 1.63. Eye equidistant, sometimes nearer to tip of snout than to spiracle. Nostril nearer eye than end of snout. Mouth usually 0.9–1.8 larger than internasal space, average 1.2. Mouth contained 0.85–2.1 in interorbital distance, average 1.45. Internasal space contained in interorbital space 1.5–2.1, average 1.8.

The dimensions of the largest tadpole are:

	Mm.		Mm.
Total length.....	75.8	Spiracle to vent.....	14.2
Body length.....	27.0	Spiracle to eye.....	8.2
Body depth.....	15.4	Eye to snout.....	8.0
Body width.....	17.8	Eye to nostril.....	4.2
Tail length.....	48.8	Nostril to snout.....	5.0
Tail depth.....	13.0	Mouth.....	5.0
Musculature of tail.....	8.0	Interorbital distance.....	7.0
Spiracle to snout.....	17.4	Internasal distance.....	3.8

RANA SPHENOCEPHALA (Cope)

Plate 7, figures 9, 10

Color description from life (June 23, 1921).—On sides of the body and over the back yellowish olive or oil green, warbler green, or olive green. The back and sides are with conspicuous black spots. On the sides and over the branchial and pectoral regions is a mottling of light brownish vinaceous or pale vinaceous drab, giving a bronzy appearance. The middle of the belly is a solid color pale cinnamon pink, light vinaceous cinnamon, or vinaceous cinnamon.

Tail.—The muscular part of the tail, upper and lower crests, are with larger black conspicuous spots than the body. The tail has some pale purplish gray, purple gray, pale violet-gray, or violet gray.

Iris black heavily punctate with greenish yellow dots; inner rim orange.

General appearance.—Tadpole large (74.5 mm.), full, and deep bodied. Venter (like that of *R. pipiens*) not strongly pigmented, so that viscera clearly show through in life or in preserved specimens. Tail medium in length, tip acute. Dorsal crest in width not equal to depth of musculature and extending on to body somewhat ahead of the vertical of the hind legs. Spiracle sinistral, decidedly upward and backward in direction, just below axis of the body. Eye on lateral axis and nearer lateral outline in dorsal aspect than mid dorsal line. Anus dextral, opening on level of the edge of the ventral crest. Spiracular opening round or elliptical. Muciferous crypts more or less distinct in mature tadpoles and sometimes quite distinct in half-grown tadpoles. The dorsal row of either side starting near the dorsal crest goes diagonally forward and outward to join the principal lateral

row, which goes from above the middle of the insertion of the tail musculature to back of the eye, where a supraorbital and an infraorbital branch goes forward.

Mouth parts.—Teeth $\frac{2}{3}$ or $\frac{3}{3}$. Upper labium edged by a fringe of teeth, the fringe longer than the beak. Below either end of this fringe is a long row of teeth about two-fifths to one-third the length of the upper fringe. The median space one-half to one time the length of the lateral row. Usually it is less than once the lateral row, while in *R. pipiens* it is almost invariably more than once the lateral row. In many tadpoles as they approach transformation there appear in either corner a short third row of labial teeth on both sides or sometimes on one side only. Also in mature tadpoles it not infrequently appears. For example, in 1912 we secured 23 tadpoles of this species, of which 6 had the third row on either side, this row 0.33–0.24 the length of the second row, and in 3 specimens the third row was present on only one side. On the lower labium are three rows of teeth. The third row is shorter than the single row of labial papillae, one-third to two-sevenths shorter than the second or first rows, or about one-sixth to one-fifth shorter than the horny beak. First and second lower labial rows about equal and slightly longer than beak. First one is sometimes subdivided in the middle.

Measurements.—Length of body (19.0–25.0 mm.) in tail (28.5–37.5 mm.) 1.35–1.66, average 1.53. Width (1.0–16.0 mm.) of body in its own length 1.56–2.1, average 1.77. Depth (9.0–15.0 mm.) of body 0.8–1.36 in body width, average 1.1. Depth of body 1.5–2.3 in body length, average 1.95. Depth (10.5–16.5 mm.) of tail in length of tail 2.0–2.88, average 2.65. Muscular part (6.0–9.5 mm.) 1.35–2.35 in depth of tail, average 1.80. Spiracle 1.2–1.7 nearer base of hind legs or vent region (8.0–14.0 mm.) than the tip of the snout (12.5–16.0 mm.), average 1.46. Spiracle 1.1–1.86 nearer eye (5.0–9.0 mm.) than base of hind legs or vent, average 1.46. Eye 1.15–1.3 nearer to tip of snout (5.0–7.0 mm.) than to spiracle (5.0–9.0 mm.), average 1.2. Nostril to snout equal to nostril to eye each 3.0–5.0 mm. Mouth (3.0–5.0 mm.) usually 0.9–1.6 larger than internasal space (2.2–5.0 mm.), average 1.25. Mouth contained 1.4–2.0 (average 1.68) in interorbital distance (5.5–7.5 mm.). Internasal space contained in interorbital space 1.4–2.3, average 1.95.

The dimensions of the largest tadpole are:

Mm.		Mm.	
Total length.....	62.5	Spiracle to vent.....	14.0
Body length.....	25.0	Spiracle to eye.....	7.5
Body depth.....	15.0	Eye to snout.....	6.5
Body width.....	16.0	Eye to nostril.....	4.5
Tail length.....	37.5	Nostril to snout.....	3.5
Tail depth.....	13.0	Mouth.....	4.5
Musculature of tail.....	9.5	Interorbital distance.....	7.0
Spiracle of snout.....	15.0	Internasal distance.....	5.0

RANA PIPIENS Schreber

Plate 7, figure 7

Color description from life (not Ridgway).—Background of back a dark brown, covered with fine gold spots and many aggregate ones on sides, the general appearance somewhat similar to that of the green frog but darker. Background on front of head rather orange. The belly is deep cream, covered with bronzelike iridescence. The gill region is pigmented with dark toward the sides, is covered all over with gold spots, and is iridescent. The throat area is translucent and more extensive than in the pickerel frog.

Tail.—Unlike the pickerel-frog tadpole, the tail is conspicuously lighter than the body, the crests being translucent and *marked* with scattered fine spots and pencilings. Gold spots occur toward the base of the tail. The eye is bronze.

General appearance.—Tadpole large (86 mm.), full, and deep bodied. Venter not strongly pigmented so that viscera clearly show through in life or preserved specimens. Tail medium in length and acute. Dorsal crest not equal in width to the musculature and extending on to body somewhat ahead of the vertical of the buds of the hind limbs. Spiracle sinistral, decidedly upward and backward in direction, below lateral axis of body. Spiracular opening plainly visible as an elliptical or round opening. Eye on lateral axis and nearer lateral outline in dorsal aspect than mid-dorsal line. Anus dextral, opening on level of edge of vertical crest. Muciferous crypts indistinct.

Mouth parts.—Teeth $\frac{2}{3}$. Edge of upper labium longer than beak and fringed with teeth. In either corner a rather long row of teeth about one-third to one-fourth the length of the upper fringe. The outer end of the lateral row about even with end of the upper fringe. The median space between lateral rows one to one and one-half times either lateral row. The third row of lower labial teeth shorter than single row of lower labial papillae, one-fourth to one-fifth shorter than horny beak, and about two-ninths shorter than first lower labial row which is longer somewhat than beak and often subdivided. The lower third row not relatively as short as in *R. palustris*, *R. clamitans*, *R. septentrionalis*, *R. grylio*, etc.

Measurements.—Length of body (19.6–28.2 mm.) 1.3–2.2 in tail length, average 1.7. Width (13–19.6 mm.) of body in its own length 1.4–1.7, average 1.5. Depth (10–14 mm.) of body 1.04–1.39 in body width, average 1.17. Depth of body 1.66–2.1 in length of body, average 1.91. Depth of tail (10.4–16.4 mm.) 2.7–3.4 in length of tail (34.2–56.2 mm.), average 3.0. Muscular part (5.2–8.8 mm.) 1.6–2.4 in depth of tail (10.4–16.4 mm.), average 1.9. Spiracle 1.25–1.7 nearer base of hind legs or vent region (9.2–12.6 mm.) than the tip of the snout (13.6–19.4 mm.), average 1.5, rarely reading 1.7 or under

1.35. Spiracle 1.40–1.86 nearer eye (5.8–8.6 mm.) than base of hind legs or vent (9.2–12.6 mm.), average 1.59. Eye 1.1–1.3 nearer spiracle (5.8–8.6 mm.) than to snout tip (6.6–8.6 mm.). Nostril 1.1–1.5 nearer eye (3.0–4.8 mm.) than snout (4.0–5.2 mm.), average 1.3. Mouth (4.2–5.0 mm.) usually 1.1–1.5 larger than internasal space (3.0–4.6 mm.), average 1.25. Mouth contained 1.3–1.8, average 1.48 in interorbital distance (5.8–8.0 mm). Internasal space contained in interorbital space 1.5–2.2, average 1.8, seldom over 2.0.

The dimensions of the largest tadpole are:

	Mm.		Mm.
Total length.....	84. 0	Spiracle to vent.....	12. 6
Body length.....	28. 0	Spiracle to eye.....	8. 0
Body depth.....	16. 4	Eye to snout.....	8. 0
Body width.....	18. 8	Eye to nostril.....	4. 0
Tail length.....	56. 0	Nostril to snout.....	5. 0
Tail depth.....	14. 8	Mouth.....	5. 2
Musculature of tail.....	8. 0	Interorbital distance.....	7. 0
Spiracle to snout.....	17. 8	Internasal distance.....	3. 8

RANA HECKSHERI Wright

Plate 8, figures 1, 3

Color description from life (July 21, 1922).—Body dark greenish olive or olive, finally covered with pale green-yellow or pale greenish-yellow flecks or spots on the dorsum. On venter they are vinaceous fawn, vinaceous cinnamon, or orange vinaceous. Just back of angle of mouth in a mature tadpole and on the venter is a clump of four to six much larger spots. Lower belly pale forget-me-not blue to upper belly and breast jay-blue, Chapman's blue, or grayish violaceous blue. Spots of back become thicker on lower belly and at times almost touch or make patches of color. Lateral line pores very prominent on the head and body.

Ventral half of muscular part of the tail light salmon orange or apricot buff or vinaceous cinnamon or ochraceous salmon. Upper half of the muscular part with a black band on caudal two-thirds and more or less merged into body color at its basal third. The black bandlike effect is produced by oblique bars of black where the muscle commas are. These overshadow the intervening body color. Whole rim of tail or edge of crests black, least just in front of the vent.

Iris rim above and below orange-cinnamon, tawny, vinaceous-tawny or orange-rufous or better vinaceous-rufous. Iris rim in front and behind pupil black.

General appearance.—Tadpole quite large (95 mm.), usually black of body, and the most striking of all our (U. S.) *Rana* tadpoles. Belly pigmented, so intestine does not show through in preserved specimens. Tail elongate, tip acuminate; dorsal crest not as wide

as musculature width; not much different from lower crest and not extending on body beyond the vertical through the buds of the hind limbs. Spiracle sinistral, just visible from dorsal aspect, divided backward and somewhat obliquely upward. Spiracle usually with a distinct semicircular impression on body and opening. Opening leaving exposed an elliptical or hemispherical patch on body. Spiracle clearly below lateral axis (musculature axis). Eye on or just above lateral axis but in dorsal aspect nearer lateral outline than mid-dorsal axis. Anus dextral, opening at edge of ventral crest.

Muciferous crypts distinct, white; a short dorsal row of a few pores on either side of middle line of the back from the dorsal crest forward; from above the middle line of insertion of tail musculature on body to a short distance behind eye a prominent dorsolateral row; apparently resumed behind eye after an interval and continued as supra-orbital and infraorbital lines to above and below the nostril; another lateral row from above insertion of hind legs to gill region where a ventral commissure goes across to the row of the other side. A third of the distance across the ventral branchial region, a branch from the commissure goes outward and forward along the jaw region almost to the mouth.

Mouth parts.—Teeth $\frac{2}{3}$ or $\frac{3}{3}$. Edge of upper labium greater than length of upper horny beak and fringed by a continuous row of teeth. Sometimes this fringe is broken up, as in figure. In either corner, beneath this fringe, is a short row of teeth about one-fourth to one-third of the length of the upper fringe. The outer end of this second row never reaches outward beyond the first fringe. Median space between these second-row teeth, one to one and one-half times the length of either lateral series of the second row. In some median-sized tadpoles the space may be greater and the second row much shorter or rarely absent. The third upper row very short, frequently absent in young and medium-aged tadpoles. From above the end of the first upper labial row of teeth to beneath the end of the third lower labial row are two or three irregular rows of papillae which are continued across lower labium's edge as one serrate row. The third labial row longer than this single row of papillae, equal to length of horny beak but one-fourth to one-fifth shorter than first and second rows, which extend beyond the ends of the horny beak. The first row is continuous or broken in the middle.

Measurements.—Length of body (32.0–41.5 mm.) in tail (50–57.5 mm.) 1.4–1.85, average 1.625. Width of body (15.0–22.5 mm.) in its own length 1.4–2.4, average 1.8. Depth (13–20 mm.) of body 0.9–1.6 in its own width, average 1.14, rarely greater than body. Depth of body 1.8–2.46 in body width, average 2.08. Depth of tail (14–18 mm.) in length of tail 2.6–4.6, average 3.2. Depth of tail

0.8–1.3 in body depth, average 1.02. Muscular part (9–11 mm.) of tail in its own tail depth 1.45–2.0, average 1.72. Spiracle 0.86–1.2 nearer vent than snout, average 1.0—i. e., about equidistant in general. Spiracle to snout (17–22 mm.) and spiracle to vent or base of hind legs (17–23 mm.). Spiracle to eye (8–12 mm.) in eye to snout (8–11 mm.) 0.85–1.2, average 0.99—i. e., eye to snout and spiracle to eye usually equidistant. Nostril to eye (4.0–6.0 mm.) equal the distance from nostril to snout (3.5–6.0 mm.). Mouth (3.0–7.0 mm.) usually 1.0–1.5 greater than the internasal space (3.0–6.5 mm.), average 1.2. Mouth contained 1.1–2.0 (average 1.46) in interorbital distance (5.0–10 mm.). Internasal space contained in interorbital space 1.4–2.0, average 1.75.

The dimensions of the largest tadpole are:

	Mm.		Mm.
Total length.....	95.0	Spiracle to vent.....	23.0
Body length.....	41.5	Spiracle to eye.....	11.5
Body depth.....	17.0	Eye to snout.....	10.0
Body width.....	17.0	Eye to nostril.....	6.0
Tail length.....	53.5	Nostril to snout.....	6.0
Tail depth.....	16.0	Mouth.....	6.5
Musculature of tail.....	11.0	Interorbital distance.....	10.0
Spiracle to snout.....	21.0	Internasal distance.....	5.0

RANA CATESBEIANA Shaw

Plate 8, figures 7, 8, 9

Color description from life (not Ridgway).—Background of back olive green, closely overlaid with fine yellow dots. Back conspicuously marked with dark spots, which become scanty on the slightly (bronzy) iridescent sides. Eye bronze. Venter is straw or maize yellow, with a few greenish spots toward the sides and sometimes in the region of the throat. It is not a distinct marbling, as in the green frog. Tail considerably lighter than back and quite regularly covered with small black spots (almost entirely lacking on the lower crest), some of which are dumb-bell shaped. The fine yellow dots are assembled in small groups.

General appearance.—Tadpole very large (145 mm.), round, and deep bodied. Some rarely reach 170 mm. Tail elongate, tip obtuse. Dorsal crest not as wide as musculature, extending forward on body slightly beyond the vertical of the buds of the hind legs or sometimes rarely to midway between these buds and the spiracle. Spiracle sinistral, just visible from dorsal aspect, directed backward and obliquely upward. Spiracle and its opening just below lateral axis of the musculature. Eye well above the lateral axis, but in dorsal aspect nearer the lateral outline than the mid dorsal axis. Anus dextral, opening on level with edge of ventral crest.

Mouth parts.—Teeth $\frac{2}{3}$ or $\frac{3}{3}$. The second upper row one-fourth to two-sevenths of the upper fringe in length. The median space

between these two lateral rows is usually one and one-half times the length of either row. The ends of these lateral rows may or may not extend to the end of the upper fringe. The upper fringe much longer than the horny beak. On lower labium three rows, the first and second about equal in length and about equal to upper fringe of teeth or slightly less and slightly longer than the horny beak. First row may be continuous or interrupted in the middle. The third row quite short for a Ranid tadpole, much shorter than the single row of lower labial papillae, one-fourth shorter than first or second lower labial rows. Labial papillae on side of labium little more than a single row, a few inner papillae usually not extending mesially beyond the end of the second row.

Hinckley (1882) gives a third small row of teeth in the lower corner of each upper lip; in 50 or more first season, second season and mature tadpoles, this occurred but once as the figures are. In two other cases, such a row was present, but it was at right or obtuse angles to the first or second rows and might have been a part of one or both of them. Sometimes the upper fringe is entirely absent, present on one side, or the teeth of it may occasionally leave the mouth and be carried back over the forehead. The second row may be missing.

Measurements.—Length of body (34–49 mm.) 1.56–2.15 in tail (62–97 mm.), average 1.8. Width (25.0–34.4 mm.) of body in its own length 1.1–1.6, average 1.3. Depth (24.4–28.6 mm.) of body 1.00–1.19 in body width (25–24.4 mm.), average 1.1. Depth of body 1.6–1.73 in length of body (34–49.0 mm.), average 1.66. Depth of tail (20–33 mm.) 2.4–3.5 in length of tail (62–97 mm.), average 2.8. Muscular part (12.5–19 mm.) 1.4–1.9 in depth of tail, average 1.8. Spiracle 1.08–1.44 nearer base of hind legs or vent region (17–24 mm.) than the tip of the snout (23–27.8 mm.), average 1.26. Spiracle 1.33–1.75 nearer eye (11.5–14 mm.) than base of hind legs or vent (17.0–24.0 mm.), average 1.55. Eye nearer to tip of snout (9.5–12.8 mm.) than to spiracle. Nostril equidistant between snout and eye. Mouth (5.5–8.0 mm.) usually 0.95–1.16 larger than internasal space (4.2–6.5 mm.), average 1.07. Mouth contained 1.3–2.1, average 1.73 in interorbital distance. Internasal space 1.75–2.2 in (9.2–14 mm.).

The dimensions of the largest tadpole are:

	Mm.		Mm.
Total length.....	142.0	Spiracle to vent.....	22.5
Body length.....	45.0	Spiracle to eye.....	12.8
Body depth.....	38.0	Eye to snout.....	12.8
Body width.....	34.4	Eye to nostril.....	6.4
Tail length.....	97.0	Nostril to snout.....	7.0
Tail depth.....	31.8	Mouth.....	7.0
Musculature of tail.....	17.2	Interorbital distance.....	11.4
Spiracle to snout.....	26.8	Internasal distance.....	4.6

RANA GRYLIO Stejneger

Plate 8, figures 2, 4

Color description from life.—Belly is between citron yellow and pale lemon yellow or lemon yellow with a prominent reticulation of brownish black. On the sides the lemon yellow spots are surrounded sometimes by pinkish vinaceous or orange vinaceous, or coral pink. All the throat region back to the pectoral region is a clear black. Across the pectoral region is apple green or light bice green. On either side of the throat and below the eye and over the snout and in front of nostril are spots of belly color. Over the back overlaying black spots and between them is forest green or dark green or elm green. When a tadpole is young it has a pinkish vinaceous line of spots or stripe on the upper jaw to be.

Tail.—The lemon yellow spots of the sides are also on the base of the muscular part of the tail as more or less rounded spots with more prominent pinkish vinaceous. About an inch from the base of the muscular part the spotting goes along on to the middle of the muscular part for an inch or less as a long band of pinkish vinaceous or as a row of spots. Below this band are some rounded pinkish vinaceous spots like the band. These extend on to the lower crest. More or less of a long black line of spots above this pinkish vinaceous band. This black line starts in the middle of the muscular part but as it approaches the tip of the tail it bends down toward the muscular black line. Upper crest with no yellow or whitish spots. Lower crest with many spots for first 2 inches.

Pupil yellow or bronzy-rimmed. Iris flecked all over with bronzy. Background of iris purplish. One looked greenish like the body color.

General appearance.—Tadpole quite large (100 mm.), with black gular area and speckled belly which is so heavily pigmented the intestine does not show through in preserved specimens. Ventral contour narrower than in *R. catesbeiana* and more of the *R. clamitans* type. Tail elongate, tip sharply acuminate. Dorsal crest at widest part about equal or slightly less than width of musculature, and extending on to dorsum slightly ahead of the vertical through the buds of the hind legs. Spiracle sinistral, just visible from the dorsal aspect, obliquely directed upward and backward, opening elliptical, but little revealed from side. Spiracle opening just touches lateral axis (muscular axis). Eye on or just above lateral axis.

Anus dextral, opening at edge of ventral crest.

Muciferous crypts present, but rather indistinct; this species easily separated from *R. clamitans* in this regard.

Mouth parts.—Teeth $\frac{3}{3}$. Edge of upper labium about equal or slightly longer than the length of the upper horny beak, and fringed

by a continuous row of teeth. In either corner beneath this fringe is only one very short row about one-sixth to one-eighth of the length of the upper fringe. Median space between these two short rows is two and one-half to four and one-half times the length of either of these rows. The outer end of the second upper row does not extend beyond the end of the upper fringe of teeth. The third lower labial row of teeth much shorter than the single serrate row of papillae, much less than length of horny beak (contained one and one-half times in it) and one-third shorter than the second or first lower rows of teeth. These two rows about equal to horny beak in length and equal to each other. The first row may be continuous or interrupted in the middle. In mouth parts it is distinctly of the *R. clamitans* type and nearer this species than *R. catesbeiana*.

Measurements.—Length of body (31.0–35.6 mm.) in tail (55.0–70.5 mm.) 1.7–2.4, average 1.84. Width (17–22 mm.) of body in its own body length 1.5–2.15, average 1.8. Depth (14–20 mm.) of body equal to (1.0) or slightly less (0.8–0.9) than body width. Depth of body 1.5–2.55 in body length, average 1.98. Depth (17–23 mm.) of tail in length of tail 1.45–1.8, average 1.7. Depth of tail 1.05–1.5 deeper than depth of body, average 1.2. Muscular part (9.5–14.5 mm.) contained in depth of tail 1.3–1.7, average 1.5; in smaller specimens 1.75–2.1. Spiracle 1.1–1.6 nearer base of hind legs or vent region (13–19 mm.) than the tip of the snout. Spiracle 1.25–1.9 nearer eye than base of hind legs or vent, average 1.56. Eye 1–1.35 nearer to tip of snout (7–10 mm.) than to spiracle (8–12.5 mm.); in some younger tadpoles occasionally near (0.88–0.95) spiracle. Nostril 1.0–1.4 nearer snout than eye, rarely equidistant. Mouth (4–6 mm.) usually 1.0–1.6 larger than internasal space (3.6–5.5 mm.), average 1.15. Mouth contained 1.5–2.37 (average 1.94) in interorbital distance (7–12.0 mm.). Internasal space contained in interorbital space 1.8–2.6, average 2.16.

The dimensions of the largest tadpole are:

	Mm.		Mm.
Total length.....	100.0	Spiracle to vent.....	19.0
Body length.....	35.6	Spiracle to eye.....	10.0
Body depth.....	20.0	Eye to snout.....	9.8
Body width.....	22.0	Eye to nostril.....	5.0
Tail length.....	64.4	Nostril to snout.....	3.5
Tail depth.....	23.0	Mouth.....	5.5
Musculature of tail.....	13.5	Interorbital distance.....	11.0
Spiracle to snout.....	21.0	Internasal distance.....	5.5

RANA SEPTENTRIONALIS Baird

Plate 8, figure 6

Color description from life (July 11, 1923).—General coloration is citrine or yellowish olive to dark olive or olive in specimens where hind legs begin to develop well. On the back are small scattered dark spots

unlike *Rana clamitans*, which is more or less uniform. When a tadpole has hind legs well developed (forelegs not out) back becomes bluish black and the hind legs stand out by color contrast by being a prominent citrine, buffy citrine, dull citrine, or olive citrine. When it reaches the four-legged stage the spots of the posterior back are quite well outlined. The mental region is grayish olive and more or less clouded. The pectoral region has a little of greenish color. Where the sides join the belly the body is mottled. Belly straw yellow, colonial buff, or deep colonial buff.

Tail.—On the lower crest along its edge are many roundish cartridge buff or pinkish buff spots. On the base of the musculature of the tail these collect as pinkish cinnamon spots suggesting somewhat the light area in a similar place on *Rana grylio* tadpoles. On the rim of the dorsal crest some of the cartridge buff spots are almost whitish. There are very few black specks on the tail in mature tadpoles. A little later the crests have prominent black spots on posterior half of the tail. In two legged tadpoles a black blotch or blotches appear with pinkish cinnamon spots at the base of the tail and these are very prominent.

Iris black and pinkish cinnamon.

Some tadpoles one month old had on the dorsum three pairs of black or dark spots: One on each nostril; one on or near each eye; and one on each side of the middle of the back. The dark of each eye connected with the back spot by an arc or semicircle of light color. This is the general appearance without a lens.

General appearance.—Tadpole large (99 mm.) of the *R. grylio* or *R. clamitans* type, but without black gular area of *R. grylio*. Venter heavily pigmented with white so intestine do not show through in life or preserved specimens. Tail elongate, tip acute. Dorsal crest not as wide as musculature, not extending forward on body much beyond the level of the buds of the hind legs. Spiracle sinistral, directed backward and obliquely upward, just visible from dorsal aspect. Spiracular opening just touches lateral axis as in *R. grylio*. Eye just above or rarely on lateral axis. Anus dextral on level with lower edge of ventral crest. Muciferous crypts distinct. A short dorsal row of 8 to 10 pores on either side of middle line of back from the dorsal crest forward; from above the middle line of insertion of tail musculature on body to back of eye is a distinct line of pores. Just before it approaches the eye area it sends obliquely upward and backward toward dorsum a short line in the direction of the end of the first row described. When this main line reaches area just back of the eye, a blind short line starts transversely across occiput but is very short, another continues as supraorbital line to above nostril,

another behind eye and underneath as infraorbital to nostril. The portion behind the eye sends off an upward and backward loop which immediately swings downward parallel with the infraorbital for a short distance, then it descends directly downward to level of upper jaw to be, and turns at right angles forward toward the mouth. Another lateral row forms a loop around the tip of the spiracle.

Mouth parts.—Teeth $\frac{2}{3}$. Edge of upper labium fringed with teeth, the fringe about the length of the horny beak, or somewhat longer. In either corner, beneath this fringe is short row of teeth one-sixth to two-fifteenths the length of the upper fringe. The outer end of the lateral row does not reach beyond the edge of the upper fringe. The medium space between these two rows is three and one-half to four and one-half times the length of either row. From above the end of the first upper labial row down to the end of the third lower row are two or three irregular rows of papillae inside the outer row of papillae. These inner to the end of the third row and in one case where the third row is lost it is replaced by papillae inside the usual single row across lower labium. Third lower row therefore about equal to the single row of papillae on lower labium, much less than horny beak, and one-third shorter than the first row of lower labial teeth. The first and second rows are about equal to horny beak. The first one often subdivided. In general it is much like *R. grylio* and one adult tadpole has a black line of spots on dorsal crest much like *R. grylio* tadpoles.

Measurements.—Length of body (24–33 mm.) in tail (45–67 mm.) 1.66–2.1, average 1.88. Width (13.5–23.0 mm.) of body in its own length 1.3–2.1, average 1.56. Depth (11–19.5 mm.) of body 1.14–1.33 in body width, average 1.23. Depth of body 1.64–2.16 in body length, average 1.85. Depth (12.0–19.0 mm.) of tail in length of tail 3.2–4.7, average 3.87. Depth of tail 0.85–1.1 in body depth, average 0.97. Muscular part (8.5–13.0 mm.) 1.3–1.9 in depth of tail, average 1.48. Spiracle 1.2–1.8 nearer base of hind legs or vent region (9–18 mm.) than the tip of the snout (16.0–22.5 mm.), average 1.37. Spiracle 1.25–1.6 nearer eye (6.5–12.5 mm.) than base of hind legs or vent, average 1.45. Eye 1.–1.4 nearer tip of snout (8–11 mm.) than spiracle (8.0–12.5 mm.), average 1.14. Nostril 1.0–1.6 nearer eye (4.0–5.5 mm.) than snout (4.0–6.5 mm.), average 1.16. Mouth (4.5–6.5 mm.) usually 1.0–1.3 larger than internasal space (4.0–6.0 mm.), average 1.11. Mouth contained in interorbital distance (6.5–9 mm.) 1.3–1.75 times, average 1.55. Internasal space contained in interorbital space 1.4–1.9, average 1.7.

The dimensions of the largest tadpole are:

	Mm.		Mm.
Total length.....	99. 0	Spiracle to vent.....	18. 0
Body length.....	32. 0	Spiracle to eye.....	12. 0
Body depth.....	19. 5	Eye to snout.....	11. 0
Body width.....	23. 0	Eye to nostril.....	5. 5
Tail length.....	67. 0	Nostril to snout.....	6. 0
Tail depth.....	18. 0	Mouth.....	6. 0
Musculature of tail.....	13. 0	Interorbital distance.....	9. 0
Spiracle to snout.....	22. 5	Internasal distance.....	5. 0

RANA ONCA Cope (probably not mature tadpole)

Plate 7, figure 3

Color description from life (August 22, 1925).—General color of upper part of body dull citrine. Back of body in detail is really a background of buffy olive or citrine drab with pale green yellow clusters scattered over it and some black intermixed. The belly is pure white or pale cinnamon pink. The region just back of the labial parts and the side of the head below eye with pale green yellow. Two dark areas over the nostrils and a dark dusky area leading diagonally back from the eye and forward from eye inclosing a sort of pale green yellow area.

Tail.—General color of upper part of base of musculature of tail, oil yellow. Tail musculature in general with pale green yellow spots. The tail musculature is really with a whole lot of black clusters outlining cartridge buff areas. These cartridge buff patches strike one as one of the characteristic features of the coloration. Along the top of musculature is considerable pale green yellow and in general the tail has a pale green yellow cast. The upper tail crest with clusters of black dots which once in a while tend to become reticulated. Lower crest is in its cephalic half or two-thirds free of black clusters. The caudal half or one-third like upper crest.

Eye.—Iris rim light pinkish cinnamon or light vinaceous fawn. The iris rim broken below with a little bit of black. In front and behind pupil is quite a large black patch with a few light vinaceous fawn specks. The upper and lower parts of iris are largely light vinaceous fawn, vinaceous buff, or light pinkish cinnamon. In these upper and lower areas is a little patch of black.

General appearance.—Tadpole medium (42 mm.), of the *R. clamitans* type. Venter less pigmented than *R. clamitans*, but intestine does not show through the skin except in little area ahead of vent. Belly somewhat transversely corrugated. Tail elongate, tip rounded. Dorsal crest or ventral crest not as wide as the widest musculature, extending on dorsum ahead of vertical of hind legs (buds) and almost halfway to the vertical of the spiracle. Spiracle sinistral, directed obliquely and decidedly upward, visible from dorsal aspect. Spi-

racular opening just below lateral axis. Eye just above or barely touches lateral axis. Anus dextral, on level with lower edge of ventral crest. Muciferous crypts indistinct in our material (up to 42 mm.).

Mouth parts.—Teeth $\frac{2}{3}$. Edge of upper labium fringed with teeth, the fringe usually about one and one-fourth, sometimes one and one-half times greater than horny beak. In either corner beneath this fringe is a very short lateral row of teeth one-eighth to one-eleventh the upper fringe in length. Rarely this row is absent, or present only on one side. The median space between these lateral rows is six to eight or ten times the length of either lateral row. This second row does not extend to the end of the upper fringe. From end of upper fringe to end of first or second row is one or one and one-half rows of inner papillae, not well developed or with inner papillae almost absent. No row of inner papillae below the third lower labial row of teeth. The first and second lower labial row of teeth are equal, slightly larger than horny beak. The first is divided in the middle, sometimes so faintly or slightly that it appears as one. The third lower labial row much shorter than the single papillary border below it, slightly less than horny beak, and contained 1.5–1.8 in first or second lower labial row.

Measurements.—Length of body (10–15.2 mm.) in tail (17.2–27 mm.) 1.5–2.0, average 1.8. Width (6.2–9.0) of body in its own length 1.6–2.0, average 1.77. Depth of body (5.0–8.6) 1.04–1.26 in body width, average 1.14. Depth of body 1.6–2.0 in body length, average 1.75. Depth of tail (6.0–9.0) in tail length 2.68–3.43, average 3.14. Depth of tail in body depth 0.75–1.05, average 0.93. Muscular part (3.0–5.2 mm.) of tail 1.5–2.0 in depth of tail, average 1.8. Spiracle 1.07–1.45 nearer base of hind legs or vent region (4.8–8.0 mm.) than the tip of snout (7.0–10), average 1.3. Spiracle 1.1–1.75 nearer eye (3.8–6.0) than base of hind legs or vent region, average 1.43. Eye 1–1.2 near tip of snout (3–5.0) than spiracle (3.8–6.0), average 1.0+. Nostril 1.1–1.9 near eye (1.18–3.0) than snout (2.2–3.8), average 1.5. Mouth (2.4–3.6) 1.0–1.3 larger than internasal space (2.0–3.2), average 1.12. Mouth contained 1.3–1.66 in interorbital distance (3.4–6.0), average, 1.49. Internasal space (2.0–3.2) contained 1.5–2.0 in interorbital space, average 1.66. The tadpole must reach a larger size than our specimens.

The dimensions of the largest tadpole are:

	Mm.		Mm.
Total length.....	42.0	Spiracle to vent.....	7.4
Body length.....	15.2	Spiracle to eye.....	6.0
Body depth.....	8.6	Eye to snout.....	5.0
Body width.....	9.0	Eye to nostril.....	3.0
Tail length.....	27.0	Nostril to snout.....	3.6
Tail depth.....	9.0	Mouth.....	3.4
Musculature of tail.....	5.2	Interorbital distance.....	3.0
Spiracle to snout.....	10.0	Internasal distance.....	5.0

RANA CLAMITANS Latreille

Plate 7, figures 5, 6

Color description from life (not Ridgway).—Background of back very dark and covered with very fine yellow spots, the whole consequently having an olive green color with numerous distinct dark spots. Belly deep cream color without decided iridescence. The throat and sides are mottled with dark green. A slight coppery iridescence on the venter is more decided on the sides and on the tail. The tail appears green, mottled with brown; it is covered with fine yellow spots like the back.

General appearance.—Tadpole large, not deep bodied. Tail fairly elongate, tip acute. Dorsal crest not as wide as musculature, extending forward on body slightly ahead of the vertical of the buds of the hind legs. Spiracle sinistral, just visible from dorsal aspect, directed obliquely upward and backward. Spiracle below lateral axis. Spiracular opening elliptical and plainly visible as such. Muciferous crypts very distinct in life, indistinct in most preserved specimens. Eye on or above lateral axis and nearer lateral outline in dorsal aspect than mid-dorsal line. Anus dextral, opening on level with edge of ventral crest.

Mouth parts.—Teeth $\frac{2}{3}$ or $\frac{1}{3}$. Edge of upper labium fringed with teeth and about equal to upper horny beak in length as in *R. grylio*. In either corner beneath this fringe is a very short row (sometimes absent) which is from two-fifteenths to one-fifteenth the upper fringe. The ends of the lateral row not extending beyond end of upper fringe. Median space between lateral rows six to eleven times the length of either row. The first lower labial row slightly longer or equal to horny beaks in length, and sometimes divided in the middle. The second row almost equal to first. The third row quite short, not nearly as long as in *R. catesbeiana*, usually almost one-half of the first row, not three-fourths or four-fifths as in *R. catesbeiana*, or two-thirds as in *R. grylio*. It is contained one and one-half times in the horny beak and is much shorter than the single row of lower labial papillae. On the side of the labium the inner papillae (inside outer row) extend mesially beyond and beneath the second lower labial row of teeth, but not to third row (more like *R. grylio*).

Measurements.—Length of body (12.2–27.8 mm.) 1.5–2.1 in tail (18.4–57 mm.), average 1.75. Width (8.8–21 mm.) of body 1.25–1.7 in its own length (12.2–27.8 mm.), average 1.47. Depth of body 1.13–1.32 in body width, average 1.22. Depth of body 1.9–2.3 in length of body, average 2.14. Depth of tail (7.4–16.6 mm.) 2.5–3.7 in length of tail (18.4–57 mm.), average 3.1. Muscular part (3.8–10.4 mm.) 1.35–1.95 in depth of tail (7.4–16.6 mm.). Spiracle 1.35–1.8 nearer base of hind legs or vent region (5.4–12.4 mm.) than the

tip of the snout (8.2–19 mm.) Spiracle 1.06–1.38 nearer eye (4.4–9.4 mm.) than base of hind legs or vent (5.4–12.4 mm.), average 1.24. Eye distinctly nearer to tip of snout (3.6–7.8 mm.) than to spiracle (4.4–9.6 mm.). Nostril decidedly nearer eye (1.4–3.6 mm.) than snout (2.2–4.8 mm.). Mouth (2.6–4.8 mm.) 0.9–1.35 larger than internasal space (2.8–4.8 mm.), average 1.06. Mouth contained 1.3–1.8, average 1.5 in interorbital distance (3.8–8.2 mm.). Internasal space contained in interorbital space 1.25–2.05, average 1.6.

The dimensions of the largest tadpole are:

	Mm.		Mm.
Total length.....	84.8	Spiracle to vent.....	12.2
Body length.....	27.8	Spiracle to eye.....	9.6
Body depth.....	17.2	Eye to snout.....	7.4
Body width.....	20.6	Eye to nostril.....	3.6
Tail length.....	57.0	Nostril to snout.....	4.0
Tail depth.....	15.6	Mouth.....	4.6
Musculature of tail.....	10.0	Interorbital distance.....	8.0
Spiracle to snout.....	19.0	Internasal distance.....	4.8

RANA VIRGATIPES Cope

Plate 8, figure 5

Color description from life (May 23, 1924).—One tadpole very large, brownish olive mummy brown or brownish olive. In general, dorsum very dark. A few large widely scattered black spots on the dorsum. The brownish olive on rear sides surrounds lemur yellow or greenish yellow spots, this yellowish color on either side of belly with a few small dark flecks. Middle of belly pale grayish vinaceous or vinaceous buff. Ventral pectoral and branchial region grayish violaceous blue or the body color with vinaceous buff and greenish yellow spots.

Tail.—In general a grayish color. Along the middle of the upper crest is row of large spots or these connected. This a much broader and more conspicuous row than in *R. grylio*, being about 2 inches long. In middle of musculature is a dark line or area to tip of tail paralleling the upper tail crest line of black. The upper tail crest is irregularly black-margined to tail tip. This black more or less outlines pale chalcedony yellow spots. The musculature has numerous pale grayish vinaceous or vinaceous buff spots. Lower tail crest narrow, with irregular black margin in tip region for 1 to 1½ inches, this crest with numerous pale chalcedony yellow or vinaceous buff spots. Iris largely black with ochraceous salmon or greenish yellow flecks.

Mouth parts.—Teeth $\frac{2}{3}$.

Measurements.—Length of body (25–30 mm.) in tail (48–63 mm.) 1.89–2.1, average 1.99. Width of body (14.5–20 mm.) in its own length 1.45–1.86, average 1.61. Depth of body (13–17 mm.) 1.1–1.2 in body width, average 1.14. Depth of body 1.66–2.07 in body

length, average 1.84. Depth of tail (16–21 mm.) in length of tail 2.9–3.6, average 3.12. Muscular part (8–11 mm.) 1.62–2.0 in depth of tail, average 1.84. Spiracle 1.17–1.33 nearer base of hind legs or vent region (14–17 mm.) than the tip of snout (17–20 mm.), average 1.23. Spiracle to eye (8–11 mm.) 1.42–1.82 nearer eye than spiracle to vent (13.5–20 mm.), average 1.62. Eye 1.0–1.22 nearer to tip of snout (7–9 mm.) than eye to spiracle (8–11 mm.), average 1.16. Nostril 1–1.42 nearer eye (4–4.5 mm.) than eye to snout (4.5–5.5 mm.), average 1.20. Mouth (5–5.5 mm.) usually 1–1.37 larger than internasal space (4–5 mm.), average 1.12. Mouth 1.36–1.8 in interorbital space (7–9 mm.), average 1.57. Internasal space (4.5–5 mm.) contained 1.55–1.87 in interorbital space, average 1.74.

The dimensions of the largest tadpole are:

	Mm.		Mm.
Total length.....	92. 0	Spiracle to vent.....	16. 0
Body length.....	30. 0	Spiracle to eye.....	11. 0
Body depth.....	15. 0	Eye to snout.....	9. 0
Body width.....	18. 0	Eye to nostril.....	4. 5
Tail length.....	63. 0	Nostril to snout.....	5. 5
Tail depth.....	21. 0	Mouth.....	5. 0
Musculature of tail.....	11. 0	Interorbital distance.....	9. 0
Spiracle to snout.....	20. 0	Internasal distance.....	5. 0

ACRIS GRYLLUS (LeConte)

Plate 6, figures 13, 14, 15

Color description from life (July 5, 1921).—General coloration dark olive buff or old gold or olive lake or sulphine yellow. Belly, especially on sides and on gill region, light vinaceous fawn or shell pink or pale salmon color. Belly with ivory yellow or cartridge buff clusters of spots. These clustered spots almost cover the top of the body. The region back of the labial mouth parts has no light vinaceous fawn nor ivory yellow. The clusters of spots become almost continuous and look a patch of french gray or lilac gray on the throat region.

Tail.—Tip of tail (upper and lower crests) conspicuously black (at times lost). Clusters of ivory yellow or cartridge buff spots on upper crest and upper part of musculature, less frequent on lower crest and lower musculature. These spots somewhat amongst black of tail tip. Tail crests almost transparent, certainly translucent, almost clear of marks except under lens, when the course of the blood vessels are marked by the body color (dark olive buff, etc.).

Iris ivory yellow above and below, behind and in front of pupil light coral red and black. Whole of iris more or less prettily marked with black interspersed with the two lighter colors mentioned.

General appearance.—Tadpole medium (42 mm.), full, and fairly deep bodied. Tail very long, tail tip very acuminate, with black flagellum.

Tail proportionally the longest and most narrow (depth of tail in length of tail) of any of the Hylids in the United States. Dorsal and ventral crests rather narrow, not equal to the tail musculature in depth. The dorsal crest extends on to the body to the vertical of the spiracle or just ahead of it but nearer spiracle than the eye. Spiracle sinistral, mainly directed backward, only slightly upward, and it stands out from body in life almost on the lateral axis. Eye on lateral axis, eye hardly if at all visible from the venter (more like a Ranid tadpole), suborbital region oblique, not vertical as in Hylids in general. Eye in dorsal aspect just inside the lateral outline. Anus dextral, opening on a level with the lower edge of the lower crest. Muciferous crypts not distinct.

Mouth parts.—Teeth $\frac{2}{2}$. Upper labium fringed with a continuous row of labial teeth; the papillary border does not extend above or inward beyond the end of the labial fringe (unlike all our Hylidae of the United States). The end of the second row of upper labial teeth extend beyond the end of the upper fringe for one-third or sometimes almost one-half of the length of this second upper labial row (in *H. crucifer* one-fourth to one-sixth the length of either lateral row). The median space between the second lateral upper labial rows of teeth long, contained 1.2–0.75 times in either lateral row, i. e., rarely greater, often equal to and more often greater than either lateral row. The horny beak is contained in upper fringe 1.2–1.35 times or 1.35–1.5 times in the distance from one end of lateral row to the end of the other lateral row. There are practically no inner papillae. The first row of lower labial teeth about equal to horny beak or slightly larger. The second row of lower labial usually perceptibly longer than the first row (the illustration is a little unusual in this respect).

Measurements.—Length of body (9.6–13 mm.) in tail (26.6–42.2 mm.) 2.5–3.25, average 2.9. Width (5.6–9.0 mm.) of body in its own length 1.44–1.9, average 1.66. Depth (4.8–8.0 mm.) of body 1.0–1.3 in body width, average 1.17. Depth of body 1.625–2.1 in length of body, average 2.0. Depth (4.2–7.8 mm.) of tail in length of tail 3.25–5.0, average 4.0. Muscular part (2.8–4.4 mm.) 1.3–2.15 in depth of tail, average 1.71. Spiracle 1.6–2.35 nearer base of hind legs or vent region (3.2–5.6 mm.) than the tip of the snout (7.0–10.0 mm.), average 1.92. Spiracle to eye usually equal to spiracle to base of hind legs or vent. Eye 1.0–1.66 nearer to tip of snout (3.0–4.2 mm.) than to spiracle (4.0–6.0 mm.), average 1.22. Nostril 1.0–1.33 nearer eye (1.4–2.4 mm.) than snout, (1.8–2.8 mm.). Mouth (1.8–2.4 mm.) usually 1.0–1.3 larger than internasal space (1.4–2.6 mm.), average 1.06, rarely less than internasal space. Mouth contained 1.3–2.2 (average 1.71) in interorbital distance (3.0–4.6 mm.). Internasal space contained in interorbital space 1.33–2.2, average 1.7.

The dimensions of the largest tadpole are:

	Mm.		Mm.
Total length.....	42. 2	Spiracle to vent.....	5. 0
Body length.....	13. 0	Spiracle to eye.....	5. 2
Body depth.....	6. 6	Eye to snout.....	4. 2
Body width.....	8. 2	Eye to nostril.....	2. 2
Tail length.....	29. 2	Nostril to snout.....	2. 4
Tail depth.....	7. 0	Mouth.....	2. 0
Musculature of tail.....	4. 0	Interorbital distance.....	4. 0
Spiracle to snout.....	10. 0	Internasal distance.....	2. 6

、 PSEUDACRIS from Hilton and Buffalo, New York

Plate 6, figure 17

Color description from life (June 12, 1923).—In general it is quite black, and bronzy in the belly and sides of the belly. The body in particular is black brown (3) or fuscous. Greenish yellow or olive yellow or citron yellow finely dots the entire upper parts. Area below the eye with dark spots. Belly solid vinaceous tawny or one of the three yellows above. Lower side of the embryonic hind legs clear while dorsum of them is with black dots.

Tail.—Blackish brown (3) or fuscous; lower edge of muscular part free of dots, once in a while a few dots in special areas. The dark color is densest just above the lower clear margin and appears as a longitudinal band. At base of muscular part there is a slight suggestion of a short light line along the middle of the side for a very short distance (as in *H. femoralis*, where better developed). On base of the musculature of the tail just where the dorsal crest joins the body are two or three saddle spots, greenish yellow, citron yellow or olive yellow. These spots are made up of a collection of dots which are more scattered along the dorsum toward the tip of the tail musculature. Dorsal crest is with elongate fleckings. The fleckings on ventral crest less frequent.

Eye blackish brown (3) or fuscous with vinaceous tawny or one of the three yellows of the body color.

General appearance.—Tadpole quite small (23 mm.), full, and deep bodied. Tail quite long, tip acute or acuminate. The dorsal and ventral crests about equal. The dorsal crest as deep as the tail musculature and extending on to the body to the vertical of the spiracle. Spiracle sinistral, directed almost straight backward, only slightly upward, far below the lateral axis near venter, the opening plainly visible, elliptical or round. Eye on the lateral axis, in dorsal aspect on the lateral outline and consequently visible from the venter. Anus dextral, opening on a level with lower edge of the ventral crest. Muciferous crypts not distinct.

Mouth parts.—Teeth $\frac{2}{2}$. Upper labium fringed with a continuous row of labial teeth: The papillae extend above and inward beyond the end of the labial fringe for about one-fourth of the length of the

upper fringe. The horny beak is contained 1.5 times in upper fringe. The median space between the second lateral upper labial rows of teeth short contained four and a half to five times in either lateral row. Upper fringe somewhat angulate in the middle. The outer ends of the second row of upper labial teeth not extending beyond the end of the upper fringe or only slightly. Inner papillae scarce, a few at either outer corner of the lower labium. The first and second row of lower labial teeth about equal, about 1.4–1.5 times the horny beak in length. There is no third row as in *Pseudacris ocularis*. The single row of papillae across the lower labial border about equal to the second lower labial row of teeth.

Measurements.—Length of body (7.0–8.8 mm.) in tail (11.0–14.2 mm.) 1.4–1.9, average 1.67. Width (4.2–5.4 mm.) of body in its own length 1.4–1.75, average 1.58. Depth (3.4–5.0 mm.) of body 1.04–1.4 in body width, average 1.14. Depth of body 1.59–2.25 in body length, average 1.77. Depth (3.4–5.0 mm.) of tail in length of tail 2.5–3.15, average 2.95. Muscular part (1.8–3.0 mm.) 1.4–2.5 in depth of tail, average 1.9. Spiracle 1.4–1.9 nearer base of hind legs or vent region (3.0–4.4 mm.) than the tip of the snout (5.0–6.0 mm.), average 1.42. Spiracle 1.15–1.7 nearer eye (2.4–3.0 mm.) than base of hind legs or vent (5.0–6.0 mm.), average 1.37. Eye 1.0–1.36 nearer spiracle (2.2–3.0 mm.) than tip of snout (2.8–3.0 mm.), average 1.15. Nostril nearer eye (1.12–1.16 mm.) than snout (2.0–2.6 mm.) 1.37–2.0, average 1.6. Mouth (1.6–2.0 mm.) usually equal to internasal space (1.6–2.0 mm.) or slightly larger. Mouth contained 1.5–2.1 (average 1.67) in interorbital distance (2.8–2.6 mm.). Internasal space contained in interorbital space 1.5–2.0, average 1.22.

The dimensions of the largest tadpole are:

	Mm.		Mm.
Total length.....	23.0	Spiracle to vent.....	3.8
Body length.....	8.8	Spiracle to eye.....	3.0
Body depth.....	5.0	Eye to snout.....	3.0
Body width.....	5.2	Eye to nostril.....	1.6
Tail length.....	14.2	Nostril to snout.....	2.6
Tail depth.....	5.0	Mouth.....	2.0
Musculature of tail.....	2.6	Interorbital distance.....	3.6
Spiracle to snout.....	5.4	Internasal distance.....	2.0

PSEUDACRIS from Raleigh, N. C.

Plate 1, figure 12

General appearance.—Tadpole small (33 mm.), full, and fairly deep of body. Tail medium in length, tail tip acuminate. Dorsal crest extends on to body about to the vertical of the spiracle. Spiraclesinistral, below lateral axis, directed backward and upward, opening round or elliptical and plainly visible. Eye on the lateral axis, in dorsal aspect on the lateral outline. Anus dextral, opening about on the level of the edge of the ventral crest. Muciferous crypts indistinct.

Mouth parts.—Teeth $\frac{2}{3}$. Upper labium fringed with a continuous row of labial teeth; the papillae extend above and inward beyond the end of the upper fringe for one-fourth to one-fifth of the length of the upper fringe. The horny beak is contained 1.5–1.75 times in the upper fringe. The median space between the second lateral upper labial rows of teeth very short, contained 2.5 or 3.7 times in the length of either row. Upper fringe somewhat angulate in the middle. Inner papillae quite numerous, two or three rows on either end of two lower labial rows, and inside the lower labial border, even beneath the third labial row. Third lower labial row about one-third of the second or first lower labial row. The lower first and second row about 1.25–1.6 times the horny beak.

Measurements.—Length of body (9.2–11.0 mm.) in tail (15.8–22.4 mm.) 1.55–2.25, average 1.8. Width (5.6–7.4 mm.) of body in its own length 1.43–1.75, average 1.69. Depth (4.8–6.6 mm.) of body 1.03–1.32 in body width, average 1.14. Depth of body 1.6–2.1 in body length, average 1.8. Depth (4.6–6.6 mm.) of tail in length of tail 2.9–4.0, average 3.4. Muscular part (2.8–4.4 mm.) 1.2–2.1 in depth of tail, average 1.64. Spiracle 1.15–1.95 nearer base of hind legs or vent region (3.6–6.0 mm.) than the tip of the snout (5.8–8.0 mm.), average 1.5. Spiracle 1.0–1.66 nearer eye (3.0–4.6 mm.) than base of hind legs or vent, average 1.33. Eye to tip of snout (3.0–4.4 mm.) about equal to eye to spiracle (3.0–4.6 mm.), occasionally larger or smaller. Nostril 1.25–1.875 nearer eye (1.4–2.2 mm.) than snout (2.0–3.2 mm.), average 1.5. Mouth (2.0–3.0 mm.) usually equal to or slightly larger 1.25 than internasal space (2.2–3.0 mm.). Mouth contained 1.33–2.2 (average 1.71) in interorbital distance (3.2–5.0 mm.). Internasal space contained in interorbital space 1.3–2.2, average 1.78.

The dimensions of the largest tadpole are:

	Mm.		Mm.
Total length.....	33.0	Spiracle to vent.....	5.0
Body length.....	10.6	Spiracle to eye.....	3.8
Body depth.....	6.6	Eye to snout.....	4.4
Body width.....	7.4	Eye to nostril.....	2.0
Tail length.....	22.4	Nostril to snout.....	3.0
Tail depth.....	6.6	Mouth.....	2.8
Musculature of tail.....	4.4	Interorbital distance.....	4.8
Spiracle to snout.....	7.5	Internasal distance.....	2.8

PSEUDACRIS OCULARIS (Holbrook)

Plate 6, figure 16

Color description from life (June 30, July 8, 1922).—Dorsal color citrine drab or deep olive. Over the dorsum of the body are definitely scattered *distinct black spots*. Lower belly a block of orient pink or orange pink. Sometimes this is broken into a mottled arrange-

ment when the gill region and sides are reached. Area around the mouth and an extension backward on each side martius yellow. Heavily speckled on under side of developing hind legs or femur when two legged stage is well started.

Tail.—Lower edge of muscular part for the basal one-half a line of martius yellow. The upper edge or rim of muscular part apricot buff to apricot orange or rufous to ferruginous. This color extends on to the top of the body and gives it the same color dorsally as upper musculature. The middle of the muscular part is with a prominent sharply defined band of chestnut brown or black at the basal half or two-fifths of the tail and hazel or cinnamon rufous onward to tip. This dark middle tail stripe extends onto the body in transforming individuals, becomes the dark stripe either side of the median dorsal stripe. From mature tadpole to transformation the three striped (light, dark, light) arrangement obtains, the lower stripe being least conspicuous. The rim of the tail crests is with large blotches. The interval between the crest rim and the musculature is translucent and without spots or dots.

Iris black, citrine drab, or deep olive, finely speckled with empire yellow or bittersweet orange.

In alcohol the broad brown tail band follows on to body to back of the eye. Above brown band is a clear white edge which extends on to the body and around the eye and then forward. Below brown band is a light band.

General appearance.—Tadpole quite small (23 mm.), full, and deep bodied (in general appearance somewhat like *H. crucifer*). Tail quite long, tail tip sharply acute or even acuminate. The dorsal and ventral crests about equal. The dorsal crest not deeper than tail musculature and extending on to the body to the vertical half-way between eye and the spiracle. Spiracles sinistral, directed backward and upward, far below lateral axis, the spiracular opening prominent, elliptical, or round. Eye on the lateral axis, in dorsal aspect on the outline and therefore visible in the ventral aspect as well. Anus dextral, opening on a level with the lower edge of the ventral crest. Muciferous crypts not distinct.

Mouth parts.—Teeth $\frac{2}{3}$. Upper labium fringed with a continuous row of labial teeth; the papillae extend above and inwards beyond the end of the labial fringe for about two-ninths to one-fourth of the length of the upper fringe. The horny beak is contained in upper fringe 2.0 times in the upper fringe. The median space between the second lateral upper labial rows of teeth long, three to four times the length of either lateral row. Inner papillae sparse or absent on upper labium and opposite the ends of horny beak. At ends of the second lower labial tooth row two or three rows. Sometimes on sides two rows of labial papillae from upper fringe down. The papillae do

not extend under second row to the end of the third row of labial teeth as in *H. crucifer*. The second row of papillae across the lower labial border is about equal to the second row of labial teeth. The third labial row of teeth is short, one-fourth to one-third the length of the first or second row of lower labial teeth. The first and second rows about equal and about two times the horny beak in length, upper fringe somewhat angulate in the middle.

Measurements.—Length of body (7.8–9.0 mm.) in tail (12–14.4 mm.) 1.33–2.0, average 1.58. Width (4.0–5.8 mm.) of body in its own length 1.3–2.1, average 1.65. Depth (3.8–5.0 mm.) of body 1.0–1.4 in body width, average 1.17. Depth of body 1.72–2.2 in length of body, average 1.90. Depth (3.2–4.0 mm.) of tail in length of tail 3.1–4.4, average 3.55. Muscular part (2.0–2.2 mm.) 1.7–2.2 in depth of tail, average 1.88. Spiracle 1.7–2.1 nearer base of hind legs or vent region (2.8–3.8 mm.) than the tip of the snout (4.8–6.8 mm.), average 1.875. Spiracle to eye (3.0–3.4 mm.) equals spiracle to base of hind legs or vent. Eye to tip of snout (2.6–3.8 mm.) about equal to eye to spiracle. Nostril 1.25–2.0 nearer eye (1.2–1.6 mm.) than snout (2.0–2.4 mm.), average 1.5. Mouth (2.0–2.8 mm.) usually equals internasal space (2.0–2.8 mm.). Mouth contained 1.5–1.9 (average 1.66) in interorbital distance (3.0–4.2 mm.). Internasal space contained in interorbital space 1.3–2.1, average 1.63.

The dimensions of the largest tadpole are:

	Mm.		Mm.
Total length.....	23.0	Spiracle to vent.....	3.8
Body length.....	8.8	Spiracle to eye.....	3.0
Body depth.....	5.0	Eye to snout.....	3.0
Body width.....	5.2	Eye to nostril.....	1.2
Tail length.....	14.2	Nostril to snout.....	2.2
Tail depth.....	3.2	Mouth.....	2.2
Musculature of tail.....	2.0	Interorbital distance.....	3.4
Spiracle to snout.....	6.8	Internasal distance.....	2.2

HYLA CRUCIFER Wied

Plate 9, figure 3

Color description from life (not Ridgway).—The background of the back is orange, heavily pigmented with dark (almost black) spots, the general tone being greenish; these dark spots are interspersed with very small shining goldlike ones. The venter is with a cream ground, pigmented with dark toward the sides and more decidedly from the gill region forward. The latter region is conspicuously marked with gold and silver. The whole is iridescent. The muscular part of the tail has an orange background at the base, becoming lighter and almost clean at the tip, the whole pigmented with small spots slightly coalesced. The crests are clear, heavily pigmented with purplish black blotches on the outer edge, particularly toward the

tip; but occasionally these blotches are absent. Small gold spots are sparsely scattered over the whole surface.

General appearance.—Tadpole small (33.0 mm.), full, and deep bodied. Tail medium in length, tip acute, no flagellum. The dorsal crest not exceeding musculature in depth and extending on to the body not beyond the vertical of the spiracle. The tail in general about medium in depth. Spiracle sinistral, more directed backwards than upwards, far below lateral axis. Eye on the lateral axis, in dorsal aspect on the lateral outline, therefore just visible from below. Anus dextral, opening above the level of the lower edge of the ventral crest. Muciferous crypts not distinct.

Mouth parts.—Teeth $\frac{2}{3}$ or $\frac{2}{5}$. Upper labium fringed with a continuous row of teeth; the papillae extend above and inward beyond the end of upper fringe one-sixth to one-fourth (usually one-sixth or more) of the length of the fringe. The end of second upper labial row extending beyond the end of the upper fringe for about one-fourth to one-sixth of the length of either upper lateral row. The horny beak contained in length from one end of lateral row to end of other lateral row 1.75–2.25 times. Median space between these lateral rows contained two to three times in the length of either lateral row. Inner papillae on sides of labium sparse and one row between second row of lower labial teeth and lower labial papillae to end of short third row. The first and second rows about equal, from 1.4–1.5 times the length of the horny beak. The third row no longer the single row of lower labial papillae. Sometimes this row of papillae is absent when this row enters the labial border, making the third row of teeth look like a lower labial goatee. This third row one-fifth to one-third the length of the first or second row of lower labial teeth.

Measurements.—Length of body (7.0–11.4) in tail (10–22 mm.) 1.4–2.1, average 1.65. Width of body (4.4–8.0) in its own length (10.0–11.4) 1.3–1.65, average 1.46. Depth (5.6–6.6) of body 1.06–1.25 in body width, average 1.125. Depth of body in body length 1.51–1.96, average 1.78. Depth of tail (4.4–7 mm.) in length of tail 2.4–3.15, average 2.72. Muscular part (1.8–4.0 mm.) of the tail in its depth 1.75–2.6, average 2.15. Spiracle 2.0–2.6 near the base of the hind legs or vent region (2.5–4.25 mm.) than the tip of the snout (5–9 mm.), average 2.16. Spiracle to eye (2.5–4.0 mm.) 1.0–1.4 nearer than to vent, average 1.1. Eye equidistant from spiracle and tip of snout ($2\frac{1}{2}$ –4 mm.). Nostril 2.0 nearer eye (1–2 mm.) than tip of snout (2–3.5 mm.). Mouth (1.8–2.5 mm.) 0.8–1.25 greater than internasal space (1.8–2.5 mm.), average 0.92. Mouth contained 1.2–2.6 in interorbital distance (2.2–5.0 mm.), usually above 1.5. Internasal space (1.8–2.5 mm.) contained 1.2–2.4 in interorbital distance, average 1.75.

The dimensions of the largest tadpole are:

	Mm.		Mm.
Total length.....	33. 0	Spiracle to vent.....	4. 0
Body length.....	11. 0	Spiracle to eye.....	3. 5
Body depth.....	6. 2	Eye to snout.....	3. 5
Body width.....	8. 0	Eye to nostril.....	1. 5
Tail length.....	22. 0	Nostril to snout.....	3. 0
Tail depth.....	7. 0	Mouth.....	2. 5
Musculature of tail.....	3. 5	Interorbital distance.....	4. 0
Spiracle to snout.....	8. 0	Internasal distance.....	2. 0

HYLA GRATIOSA LeConte

Plate 9, figures 9, 10, 11

Color description from life (June 23, 27, August 21, 1922).—They have considerable greenish, greenish yellow or yellowish in the tail and body and are beautiful tadpoles. Halfgrown tadpoles have a striking black saddle spot on the back of the muscular part of the tail and two prominent light areas from each eye to the vent.

On the side, a patch just ahead of developing hind legs light greenish yellow. Black stripe from between the eye, along the base of the upper crest on either side half way to tip of the tail. Light area beneath this black area and around nostril, over eye, along side to base of muscular part of the tail ivory yellow, tilleul buff, or pale pinkish buff. Another short line of the same color at the very base of the upper crest and above the black stripe. Muscular part of the tail and crest yellowish citrine, light yellowish olive, mignonette green or cource green. Belly pale vinaceous pink. Either side of gill region congo pink, throat clear. Lower lip like muscular tail, yellowish citrine or cource green.

Iris vinaceous pink.

General appearance.—Tadpole medium (50 mm.) largest of Hylid tadpoles of the eastern United States. Tail long. Tip acuminate, with flagellum. Dorsal and ventral crests about equal, either depth equal to the tail musculature. Dorsal crest extending on body to a vertical about half way between the spiracle and the eye. Spiracle sinistral, far below lateral axis, directed upward and backward. Eye on lateral axis, in dorsal aspect in the lateral outline and in consequence visible from the venter. Anus dextral, on a level with the lower edge of the ventral crest. Muciferous crypts indistinct.

Mouth parts.—Teeth $\frac{2}{3}$. Upper labium fringed with row of teeth; the papillae extend above and inward beyond the end of this fringe two-sevenths to one-fourth (usually at least one-fourth) of the length of the fringe. The end of the second row about even with the end of the fringe. Sometimes the ends unite. The horny beak contained in the length of the upper fringe 1.5–1.75 times. Median space

between the two lateral parts of the second rows contained 1.5-3. times either lateral row. Inner papillae on either side from end of lateral upper row one or two rows to end of lower third labial row. The lower third labial row with one row of papillae below it, rarely with none, and about equal to this single row of papillae, or two and five-eighths to three and one-half times in the length of the first or second rows. The first or second lower labial rows about equal or about one and one-third longer than horny beaks. Some of the teeth rows have tendency to be curved on ends or united at other rows or be quite irregular, more so than in any other United States Hyliid.

Measurements.—Length of body (13.5-20 mm.) in tail (27-32 mm.) 2.3-3.25, average 2.5. Width (9-13 mm.) of body in its own length 1.5-2.0, average 1.71. Depth (9.5-13.5 mm.) of body 0.8-1.0 in body width, average 0.9. Depth of body 1.4-1.9 in body length, average 1.62. Depth (10-14 mm.) of tail in length of tail 2.0-2.8, average 2.34. Muscular part (4.5-8.5 mm.) 1.5-2.9 in depth of tail, average 2.0. Spiracle 1.0-1.375 nearer base of hind legs or vent region (8.0-10.0 mm.) than the tip of the snout (10-12 mm.), average 1.2. Spiracle 1.6-2.5 nearer eye than base of hind legs or vent, average 1.9. Eye 1.07-1.75 nearer to spiracle (4.0-5.6 mm.) than to tip of snout (6.0-7.0 mm.), average 1.3. Nostril 1.0-1.8 nearer eye (2.5-4.0 mm.) than snout (3.5-4.5 mm.). Mouth (3.5-4.5 mm.) usually 1-1.5 larger than internasal space (3.0-4.0 mm.), average 1.075. Mouth contained 1.33-2.4 (average 1.88) in interorbital distance (6.5-8.5 mm.). Internasal space contained in interorbital space 1.62-2.33, average 2.15.

The dimensions of the largest tadpole are:

	Mm.		Mm.
Total length.....	50.0	Spiracle to vent.....	10.0
Body length.....	19.0	Spiracle to eye.....	5.5
Body depth.....	12.0	Eye to snout.....	7.0
Body width.....	10.5	Eye to nostril.....	4.0
Tail length.....	31.0	Nostril to snout.....	4.0
Tail depth.....	11.0	Mouth.....	4.5
Musculature of tail.....	7.0	Interorbital distance.....	7.0
Spiracle to snout.....	11.5	Internasal distance.....	3.5

HYLA ANDERSONII Baird

Plate 9, figures 7, 8

Color description from life (May 23, 1924).—General coloration of body olive, brownish olive, or dark olive. Back with scattered black spots. Gill region with a sheen of ochraceous salmon or vinaceous tawny or vinaceous salmon. Interspersed with this color is some black. The mental region is clear of color. Below eye blotched with black, bronze (or one of three gill region colors) and green yellow.

Over the belly in younger specimens is a full block of ochraceous salmon or vinaceous tawny or vinaceous cinnamon. In older specimens green-yellow or citron yellow or sometimes sea-foam yellow across the belly or on the gill region.

Tail.—Starting from the base of the tail there is a longitudinal irregular blackish band along the musculature of the tail to its top one-half of an inch or more from the tip of the tail. This band is more or less interrupted, not a clearly defined band as in *Hyla femoralis* or is *Pseudacris ocularis* or other *Pseudacris* species. Below the band is a clear area of warm buff or cream color or cartridge buff or sea-foam yellow. In some specimens there is a similarly colored area one-eighth to one-fourth inch long above the dark band. The very lower edge of the musculature is with a fine purplish line. Just above this edge are a few scattered collections of black dots. Upper and lower crests heavily clouded with blackish dots, which in places assemble in clusters. In younger tadpoles quite a prominent irregular margin of blackish on the crests and the musculature band of black more regular and not so interrupted.

Eye with pupil rim prominent ochraceous salmon or vinaceous tawny or vinaceous cinnamon. Rest of iris spotted with this color and black. All in all it is a prominently colored eye.

General appearance.—Tadpole small (35 mm.), full, and deep-bodied. Tail medium to fairly long, tail tip acuminate or sharply acute. The dorsal and ventral crests about equal. The dorsal crest is less than the depth of the musculature and extends on to the body to the vertical midway between hind legs and the spiracle. Spiracle sinistral directed upward and backward, far below lateral axis, the spiracular opening plainly visible and elliptical or round. Eye just touches or is below the lateral axis, is in dorsal aspect on the lateral outline and in consequence visible from the venter. Anus dextral, opening at or only slightly above the lower edge of the ventral crest. Muciferous crypts not distinct.

Mouth parts.—Teeth $\frac{2}{3}$. Upper labium fringed with a continuous row of labial teeth; the papillae extend above and inward beyond the end of the upper fringe for about two-sevenths to one-fourth of the length of the upper fringe. The end of the second upper labial row may be even or beyond the end of the fringe. The horny beak is contained in upper fringe 1.5–1.7 times. Median space between the lateral second upper labial row 1.25–2 in the length of either lateral row. The lateral row is contained about two and one-half times in the upper fringe. The inner papillae extend beneath the third lower labial row of teeth, giving a two-rowed appearance of papillae below it, like *Hyla cinerea*. The third row of labial teeth is short (in one specimen subdivided) and is two-ninths to one-third times (usually two-fifths, rarely as small as one-fifth) in the length of

the first or second rows. The first and second rows about equal or one and one-half greater than the horny beaks.

Measurements.—Length of body (10.0–12.0 mm.) in tail (11.5–23.0 mm.) 1.1–2.0, average 1.67. Width (6.0–7.2 mm.) of body in its own length 1.5–1.85, average 1.65. Depth (5.0–6.5 mm.) of body 1.0–1.85 mm. in body width, average 1.2. Depth of body 1.61–2.18 in body length, average 1.86. Depth (5.0–7.0 mm.) of tail in length of tail 2.5–3.5, average 3.0. Muscular part (2.0–3.0 mm.) 1.9–2.5 in depth of tail, average 2.1. Spiracle 1.0–1.5 nearer base of hind legs or vent region (5.0–7.0 mm.) than the tip of the snout (6.0–9.0 mm.), average 1.22. Spiracle 1.25–2.3 nearer eye (2.5–4.8 mm.) than base of hind legs or vent, average 1.86. Eye 1.0–1.6 nearer to spiracle (2.5–3.5 mm.) than to tip of snout (3.0–4.2 mm.), average 1.25. Nostril 1.2–2.1 nearer eye (1.2–2.5 mm.) than snout (2.5–3.0 mm.), average 1.5. Internasal space (2.2–3.2 mm.) usually 0.75–1.6 larger than mouth (2.0–3.0 mm.), average 1.25. Mouth contained 1.33–2.5 (average 1.85) in interorbital distance (4.0–5.5 mm.). Internasal space contained in interorbital distance 1.33–2.2, average 1.8.

The dimensions of the largest tadpole are:

	Mm.		Mm.
Total length.....	35.0	Spiracle to vent.....	6.0
Body length.....	12.0	Spiracle to eye.....	4.8
Body depth.....	5.5	Eye to snout.....	4.2
Body width.....	7.2	Eye to nostril.....	2.5
Tail length.....	23.0	Nostril to snout.....	3.0
Tail depth.....	6.5	Mouth.....	3.0
Musculature of tail.....	3.0	Interorbital distance.....	5.0
Spiracle to snout.....	9.0	Internasal distance.....	2.8

HYLA CINEREA (Schneider)

Plate 9, figure 12

Color description from life (July 26, 1921).—Top of body generally citrine to olive green or oil green, sometimes a bright spinach green or forest green. Stripe on side of head from snout to eye sulphur yellow and ivory yellow. Belly solid cartridge buff or ivory yellow. Breast and lower throat light vinaceous fawn. Mental region and upper throat dusky slate-blue with scattered spinach green spots. Sides of the body in branchial region and under eye spotted dusky slate blue, or slate-blue, light vinaceous fawn, cartridge buff, sulphur yellow.

General color of tail sulphine yellow to citrine. Base of muscular part of tail with some light vinaceous fawn spots along the middle of it for 1 centimeter or more. In almost mature tadpoles not black spots on the crests. About time hind legs begin to grow, upper and lower crests with prominent blackish spots. Fine spinach green

flecks over tail except near the edges of the tail crests. In the younger tadpoles without blackish spots the black is in specks all over the tail and these faintly appear on the tail crests as dark edges.

Iris light cadmium to buffy yellow with dusky in front and behind the pupil.

General appearance.—Tadpole medium (40 mm.), full, and deep bodied. Tail acuminate; tip acuminate, sometimes acute. Tail long. The dorsal and ventral crests about equal and about equal to musculature in depth. The dorsal crest extending on to the body to the vertical about midway between the eye and spiracle. Spiracle sinistral, directed upward and backward, far below lateral axis, the spiracular opening very visible as a round or elliptical opening. Eye on lateral axis, in dorsal aspect on the lateral outline and in consequence visible from the venter. Anus dextral, at or only slightly above the lower edge of the ventral crest. Muciferous crypts not distinct. As they approach transformation the whole tail becomes spotted with conspicuously dark and light spots.

Mouth parts.—Teeth $\frac{2}{3}$. Upper labium fringed with a continuous row of labial teeth; the papillae extend above and inward beyond the end of the fringe for about one-fourth to two-ninths of the length of the upper fringe. The end of the second row is usually even with the end of the upper fringe. The horny beak is contained in the upper fringe 2-2.3. Median space between the lateral second upper labial row three or four times in the length of the lateral row. The latter row about two and one-half times in the upper fringe. Inner papillae extend beneath the third lower labial row of teeth after giving a two-rowed appearance below it, like *H. andersonii*, *H. femoralis*, *H. versicolor* or *H. squirella*. The third lower row of teeth, however, is not like this group, but shorter, like *H. gratiosa* or *H. crucifer*. In one specimen it was absent, with the papillae below also absent. This third row is contained two-fifths to one-fourth in the length of the first or second row of lower labial teeth. The first and second rows (lower labial) about equal or one and one-third greater in length than horny beaks. Sometimes fringes are united by their ends as in *H. gratiosa*.

Measurements.—Length of body (11-15 mm.) in tail (16-25 mm.) 1.25-2.0, average 1.6. Width (6-7.5 mm.) of body in its own length 1.8-2.2, average 1.9. Depth of body (6.0-7.0 mm.) equals body width. Depth of body 1.69-2.5 in body length, average 1.95. Depth (7.0-8.0 mm.) of tail in length of tail 2.0-3.125, average 2.75. Muscular part (4.0 mm.) 1.75-2.4 in depth of tail, average 1.925. Spiracle 1.15-1.6 nearer base of hind legs or vent region (5.0-7.0 mm.) than the tip of the snout (8.0-9.0 mm.), average 1.375. Spiracle 1.4-2.3 nearer eye (3.0-3.5 mm.) than base of hind legs or vent, average 1.88. Eye 1.1-1.66 nearer spiracle (3.0-3.5 mm.) than to

tip of snout (3.8–5.0 mm.), average 1.38. Nostril 1.0–1.5 nearer eye (1.8–2.5 mm.) than snout (2.0–3.5 mm.), average 1.35. Mouth (2.0–3.5 mm.) 1.0–1.4 in internasal space (3.0–4.0 mm.), average 1.25. Mouth contained 1.6–2.0 (average 1.83) in interorbital distance (5.0–6.0 mm.). Internasal space contained in interorbital space 1.25–1.8, average 1.48.

The dimensions of the largest tadpole are:

	Mm.		Mm.
Total length.....	40.0	Spiracle to vent.....	7.0
Body length.....	15.0	Spiracle to eye.....	3.0
Body depth.....	6.0	Eye to snout.....	5.0
Body width.....	7.0	Eye to nostril.....	2.5
Tail length.....	25.0	Nostril to snout.....	3.5
Tail depth.....	8.0	Mouth.....	3.0
Musculature of tail.....	4.0	Interorbital distance.....	6.0
Spiracle to snout.....	9.0	Internasal distance.....	4.0

HYLA REGILLA Baird and Girard

Plate 4, figure 5

General appearance.—Tadpole medium (45 mm.), full, and deep bodied. Tail medium or fairly long, tip acute or obtuse. No flagellum. The dorsal crest not exceeding the musculature in depth, extending on to body to the vertical through the posterior edge of the eye. Tail in general quite deep. Spiracle sinistral, more directed backward than upward, opening plainly visible as a round or elliptical opening. Spiracle far below lateral axis. Eye on the lateral axis, in dorsal aspect on the lateral outline, therefore just visible from venter. Anus dextral, opening just above the level of the lower edge of the ventral crest. Muciferous crypts not distinct.

Mouth parts.—Teeth $\frac{2}{3}$. Upper labium fringed with a continuous row of teeth; the papillae extend above and inward beyond the end of upper fringe one-seventh to one-fifth (usually one-fifth) of the length of the upper fringe. The end of the second upper labial row may extend beyond the end of the upper fringe or be even with it. The horny beak may be contained in horny fringe or combined upper lateral rows 1.8–1.4 times. Median space between these lateral rows contained usually three (sometimes 2.5–5.0 times) times the length of the lateral rows. Usually a well-formed inner row of papillae on side of labium down almost to the end of the lower labial row. The third row of lower labial teeth with only a single row of papillae below it as in *H. crucifer* or *H. gratiosa* and unlike the other five or six species studied. Third row usually contained about three times in length of first or second lower labial teeth rows (sometimes 2.5–3). The first and second lower labial teeth longer than beak.

Measurements.—Length of body (13.0–16.0 mm.) in tail (20–30 mm.) 1.46–1.875, average 1.68. Width of body (6.2–9.4 mm.) in its own length 1.6–2.1, average 1.74. Depth of body (5.0–9.8 mm.)

in body width, average 1.12. Depth of body 1.5–2.0 in body length, average 1.8. Depth of tail (7.5–9.0 mm.) in length of tail 1.5–3.21. Muscular part of tail (3.0–3.6 mm.) 2.3–2.8 in depth of tail, average 2.56. Spiracle 1.05–1.4 nearer base of hind legs (5.8–9.0 mm.) than snout (8–10.0 mm.), average 1.25. Spiracle 1.6–1.75 nearer eye (3.0–4.6 mm.) than base of the hind legs or vent, average 1.65. Eye 1–1.4 nearer spiracle (3.0–4.6 mm.) than tip of snout (4.2–5.4), average 1.19. Nostril 1–1.7 nearer eye (2.0–2.2 mm.) than tip of snout (2.2–3.8 mm.), average 1.4. Mouth (2.4–3.4 mm.) usually 1.06–1.2 larger than internasal space (2.0–3.2 mm.). Mouth contained 1.4–1.7 times (average) in interorbital distance (4.0–5.4 mm.). Internasal space contained in interorbital space 1.5–2.0, average 1.72.

The dimensions of the largest tadpole are:

	Mm.		Mm.
Total length.....	46.6	Spiracle to vent.....	9.0
Body length.....	16.0	Spiracle to eye.....	3.0
Body depth.....	8.0	Eye to snout.....	4.2
Body width.....	9.2	Eye to nostril.....	2.2
Tail length.....	30.0	Nostril to snout.....	3.6
Tail depth.....	9.0	Mouth.....	3.0
Musculature of tail.....	3.2	Interorbital distance.....	3.0
Spiracle to snout.....	9.6	Internasal distance.....	4.6

HYLA FEMORALIS Latreille

Plate 9, figure 6

Color description from life (July 8, July 26, 1921).—Upper parts of body olivaceous black to dull greenish black. Throat on either side below eye pomegranate purple. Belly on sides and across breast light vinaceous purple; center of belly solid sulphur-yellow. Chin clear with very little or no black dots. In younger tadpoles general color light yellowish olive or grayish olive. All over upper parts are fine grayish vinaceous or light vinaceous fawn dots and on the muscular part of tail but not on the crests. These dots become larger on dark upper eyelid and give a conspicuous arrangement. In half-grown tadpoles a cream-colored ring under the eye and extending backward on either side of back for a distance. In very young tadpoles the ring is almost complete about eye but not on the back. This ring faintly present in mature tadpoles and extends backward on to the base of the musculature of the tail. Under the eye it is warm buff, on body buffy brown, cartridge buff, or tiller buff.

Tail.—Beginning at body there runs along musculature for one-half or more of its length a white, cartridge buff or pale cinnamon pink stripe, marked off by the dark brown or black ground color of the upper half of the musculature and the lower half of the same part. Upper and lower crests with prominent large spots, black in younger specimens and clusters of mouse gray on mature tadpoles. The

tip of tail (both upper and lower crests) clear of spots. Area of crest next to musculature clear in upper and lower crests. Light area of tail crests more or less suffused with light coral red or coral red, suggestive of *H. versicolor* tadpoles.

Iris, the outer part olivaceous black to dull greenish black, inner circle and part of rest light vinaceous fawn, buff pink or light ochraceous salmon.

General appearance.—Tadpole small (36 mm.), full, and deep bodied. Tail medium to fairly long, tip acuminate and very pointed. Tail with a prominent flagellum, the dorsal and ventral crests of which are usually colorless. Tail deep and dorsal and ventral crests well developed. The dorsal crest may exceed the musculature in depth and extends on to the body to the vertical of the spiracle or halfway between spiracle and eye. Spiracle sinistral, directed more backward than upward, far below the lateral axis and visible as an elliptical opening. Eye on the lateral axis, in dorsal aspect on the lateral outline and in consequence visible from the venter. Anus dextral, very near the level of the edge of the lower crest. Muciferous crypts indistinct.

Mouth parts.—Teeth $\frac{2}{3}$. Upper labium fringed with a continuous row of labial teeth; the papillae extend above and inward beyond the end of the upper fringe for about four-elevenths to two-fifths of the length of the upper fringe. The end of the second row usually is even with the end of the upper fringe. The horny beak is contained about 2.0 times in the upper fringe. The median space between the lateral second upper labial very short, six to ten times the length of either lateral row. The inner papillae extend under the third row of lower labial teeth making at least two rows of papillae across the lower labial border. In the lower labial corner there is a heavy papillary series of four or five rows like *H. versicolor* or *H. squirella*. The lower third labial is long and is usually about 1.10–1.2 in the first or second row, longer than in *H. squirella* and is larger than the horny beak. The first and second rows are about equal and 1.4–1.6 greater than the horny beak. This species, like *Hyla versicolor* and *Hyla squirella* has a very angulate upper fringe at its middle.

Measurements.—Length of body (8.0–12.0 mm.) in tail (13.5–2.40 mm.) 1.3–2.8, average 1.75. Width (4.5–6.5 mm.) of body in its own length 1.6–2.1, average 1.8. Depth (4.5–7.0 mm.) of body usually slightly greater than body width (4.5–6.5 mm.). Depth of body 1.33–2.2 in body length, average 1.68. Depth (4.5–10 mm.) of tail in length of tail 1.6–2.75, average 2.25. Muscular part (2.5–4.5 mm.) 1.8–2.3 in depth of tail, average 2.1. Spiracle 1.1–1.4 nearer base of hind legs or vent region (5.0–6.0 mm.) than the tip of the snout (5.5–8.0 mm.), average 1.24. Spiracle 1.5–2.5 nearer eye (2.0–

4.0 mm.) than base of hind legs or vent (5.0–6.0 mm.), average 1.87. Eye 1.0–1.75 nearer to spiracle (2.0–4.0 mm.) than to tip of snout (3.2–4.5 mm.), average 1.25. Nostril 1.2–2.3 nearer eye (1.2–2.5 mm.) than snout (2.0–3.0 mm.), average 1.85. Mouth (2.0–3.5 mm.) equal to the internasal space (2.0–3.5 mm.). Mouth contained 1.4–2.0 (average 1.65) in interorbital distance (3.5–6.0 mm.). Internasal space (2.0–3.5 mm.) contained in interorbital space 1.3–2.0, average 1.7.

The dimensions of the largest tadpole are:

	Mm.		Mm.
Total length.....	33. 0	Spiracle to vent.....	6. 0
Body length.....	10. 0	Spiracle to eye.....	4. 0
Body depth.....	5. 0	Eye to snout.....	3. 2
Body width.....	6. 5	Eye to nostril.....	1. 5
Tail length.....	22. 5	Nostril to snout.....	3. 0
Tail depth.....	7. 5	Mouth.....	3. 0
Musculature of tail.....	3. 5	Interorbital distance.....	5. 0
Spiracle to snout.....	8. 0	Internasal distance.....	3. 5

HYLA ARENICOLOR Cope

Plate 9, figure 2

Color description from life (July 11, 1925).—Upper parts of body dark greenish olive, dark olive, or deep olive. Back dotted with fine light yellowish olive specks. Pectoral and branchial regions of venter light vinaceous fawn. Belly a solid pale cinnamon pink, on sides of belly light vinaceous fawn or light vinaceous cinnamon or white.

Tail.—Heavily blotched with black on outer or upper half of upper crest and on outer or lower half of the caudal half of lower crest. The area next to the musculature free of black. In some tadpoles tail fins suffused with some “reddish” orange pink, coral pink, or coral red, as in *H. versicolor*. Some spots of light vinaceous fawn on the lower side of the musculature for the first inch or more. Also some bright green yellow with it. Some black more or less in the middle line of the musculature. Caudal half of tail musculature with many large black spots.

Iris dark greenish olive or dark olive heavily dotted with greenish yellow specks above and below the pupil; a clear dark greenish olive or black area behind and ahead of the pupil. Pupil rim with greenish yellow ring. Pupil rim with small emargination below.

General appearance.—Tadpole medium (50.0 mm.), not so deep bodied as *H. versicolor*. Tail long or very long, rather narrow for a Hylid of *H. versicolor* group, quite attenuated, but tail tip rounded. Dorsal and ventral crest each less deep than the musculature. Dorsal crest reaching the vertical of spiracle or not reaching it. Spiracle

sinistral, directed obliquely backward, the opening elliptical. Spiracle low, exactly on edge of ventral outline. Eye on lateral axis in dorsal aspect just inside the lateral outline and not visible from the venter. Anus dextral, very near or at edge of lower tail crest. Muciferous crypts indistinct.

Mouth parts.—Teeth $\frac{2}{3}$. Upper labium fringed with a continuous row of labial teeth; the papillae extend above and inward beyond the end of the upper fringe for about one-fourth to one-seventh of the length of the upper fringe. The end of the second row usually is even with the end of the upper fringe of teeth; the horny beak is contained 1.8–2.0 times in upper fringe. The median space of second upper row very short, eight to ten times in the length of either half. The inner papillae poorly developed, two to three rows at end of three series of lower teeth, not as well developed as in *H. femoralis*, *H. squirella*, or *H. versicolor*. Beneath the third lower labial row no inner papillae or very scarce. The third lower labial row equal to or slightly shorter than the first lower row. The first and second rows of lower teeth are about equal or the second row the longer and 1.5–2.0 greater than horny beak. This species has the longest second lower row of its group (*H. versicolor*, *H. femoralis*, *H. arenicolor*, *H. squirella*).

Measurements.—Length of body (11.4–15.4 mm.) in tail (2.0–33 mm.) 1.7–2.2, average 1.83. Width (6.4–9.0 mm.) of body in its own length 1.6–2.0, average 1.76. Depth (5.0–7.6 mm.) of body 0.95–1.4 in body width, average 1.14. Depth of body 1.75–2.3 in body length, average 2.02. Depth (6.0–8.0 mm.) of tail in length of tail (20–33 mm.) 2.85–5.15, average 3.73. Muscular part (4.0–5.0 mm.) 1.28–1.76 in depth of tail, average 1.62. Spiracle 1.13–1.55 nearer base of hind legs or vent region (5.8–7.2 mm.) than the tip of the snout (7.8–10.4 mm.), average 1.37. Spiracle 1.44–2.42 nearer eye (2.8–5.0 mm.) than base of hind legs or vent, average 1.78. Eye 1.0–1.7 nearer spiracle (2.8–5.0 mm.) than to tip of snout (4.6–6.0 mm.), average 1.36. Nostril nearer eye (2.0–3.0 mm.) than snout (3.6–5.0 mm.), average 2.08. Mouth (3.0–5.0 mm.) usually 0.83–1.7 larger than internasal space 2.2–4.0, average 1.3. Mouth contained 1.15–1.95 (average 1.46) in interorbital distance (5.0–7.0 mm.). Internasal space (2.2–4.0 mm.) contained in interorbital space 1.3–2.33, average 1.95.

The dimensions of the largest tadpole are:

	Mm.		Mm.
Total length.....	50.0	Spiracle to vent.....	7.0
Body length.....	15.4	Spiracle to eye.....	4.2
Body depth.....	7.0	Eye to snout.....	6.0
Body width.....	9.0	Eye to nostril.....	2.6
Tail length.....	33.0	Nostril to snout.....	5.0
Tail depth.....	6.4	Mouth.....	5.0
Tail, musculature of.....	5.0	Interorbital distance.....	7.0
Spiracle to snout.....	10.4	Internasal distance.....	4.0

HYLA VERSICOLOR (LeConte)

Plate 9, figures 4, 5

Color description from life (not Ridgway).—General color of back olive green. Background of back yellowish, covered with many fine hairlike black markings and golden and black spots, becoming orange in the head region and sometimes almost vermilion about the eye; the golden and black spots are more pronounced toward the tail; on the sides is a decided iridescence. The eye is slightly bronzy. The venter in general is conspicuously white or light cream and slightly iridescent. The belly is covered with fine golden spots. From the gill region forward the venter is greenish, a coloration produced by black and golden spots. The background of all the tail except the base is scarlet or orange-vermilion. The base of the tail is like the body. The tail is covered with black blotches, more prominent around the edges of the crests. These blotches become much more numerous as the hind legs develop.

General appearance.—Tadpole medium (46.6 mm.), full, and deep bodied. Tail very long, deep, tip very acuminate with a prominent flagellum. The dorsal crest is as deep as the musculature and extends on to the body to the vertical between the spiracle and the eye or to the spiracle. Spiracle sinistral, directed more backward than upward, far below the lateral axis and visible as an elliptical opening. Eye on lateral axis, in dorsal aspect on the lateral outline and in consequence visible from the venter. Anus dextral, very near or at the level of the edge of the lower tail crest. Muciferous crypts indistinct.

Mouth parts.—Teeth $\frac{2}{3}$. Upper labium fringed with a continuous row of labial teeth; the papillae extend above and inward beyond the end of the upper fringe for about one-third of the length of the upper fringe. The end of the second row usually is even with the end of the upper fringe. The horny beak is contained about two times in the upper fringe. The median space between the lateral second upper labial rows quite short, 3.25–5 times the length of either lateral row. The inner papillae extends under the third row of lower labial teeth, making at least two rows of papillae across the lower labial border. In the lower labial corner there is a heavy papillary series of two or three rows, not so pronounced as in *Hyla squirella* or *Hyla femoralis*. The lower third labial teeth is long and is contained usually about 1.10–1.25 times in the first or second row. The first or second rows about equal and 1.8–2.0 greater than the horny beak. This species like *Hyla femoralis* and *H. squirella* has an angulate upper fringe at its middle.

Measurements.—(Okefinokee specimens). Length of body (14.8–16.0 mm.) in tail (27.4–31.2 mm.) 1.75–2.1 average, 1.92. Width

(9.6–11.4 mm.) of body in its own length 1.38–1.6, average 1.5. Depth (8.2–10.0 mm.) of body 1.0–1.2 in body width, average 1.08. Depth of body 1.5–1.8 in body length, average 1.64. Depth (8.6–9.0 mm.) of tail in length of tail 3.1–4.0, average 3.6. Muscular part (4.6–5.0 mm.) 1.72–1.9 in depth of tail, average 1.8. Spiracle 1.3–1.6 nearer base of hind legs or vent region (6.6–9.0 mm.) than the tip of the snout (9.8–11.4 mm.). Spiracle 1.12–1.5 nearer eye than base of hind legs or vent, average 1.33. Eye to spiracle (5.0–6.0 mm.) about equal to eye (5.0–6.0 mm.). Nostril 1.36–1.8 nearer eye than snout. Mouth (3.4–4.0 mm.) in 1.1–1.35 internasal space (4.2–4.8 mm.), average 1.25. Mouth contained 1.65–2.05 (average 1.8) in interorbital distance (6.0–7.6 mm.). Internasal space contained in interorbital space 1.35–1.6, average 1.45.

The dimensions of the largest tadpole are:

	Mm.		Mm.
Total length.....	46.6	Spiracle to vent.....	7.6
Body length.....	15.8	Spiracle to eye.....	6.0
Body depth.....	10.0	Eye to snout.....	5.0
Body width.....	11.4	Eye to nostril.....	2.2
Tail length.....	30.8	Nostril to snout.....	3.0
Tail depth.....	8.8	Mouth.....	3.6
Musculature of tail.....	5.0	Interorbital distance.....	4.2
Spiracle to snout.....	10.0	Internasal distance.....	6.0

HYLA SQUIRELLA Latreille

Plate 9, figure 1

Color description from life (June 23, 1922).—General color of body citrine drab. In general it has a greenish cast like tadpoles of *Hyla cinerea* and *H. gratiosa*. Developing ventral flap between hind legs ecru-olive; throat from line of eye to eye to mouth same color. Area behind gill area ocher red. Belly pigmented testaceous and chalcidony yellow. These make a solid iridescence which on the sides and across the middle venter becomes replaced with black.

Tail.—Muscular part of tail dark olive buff. Muscular part without prominent clusters of blackish spots. The dots are uniformly scattered over the muscular part but slightly thicker near the tip. The tail reminds one more of a *Ramid* tadpole tail in coloration. *

Iris more or less black with a rim of testaceous or light coral red and chalcidony yellow spots amongst the black.

General appearance.—Tadpole small (32 mm.), full, and fairly deep bodied. Tail long, tail tip acuminate, a flagellum present. Dorsal and ventral crests well developed and tail in general deep. Dorsal crest not as deep as the tail musculature. Dorsal crest extends on to the body about to the vertical of the spiracle. Spiracle sinistral directed upward and backward, well below the lateral axis, the spiracular opening prominent elliptical lateral axis, is in dorsal

aspect on the lateral outline and in consequence is visible from the venter. Anus dextral, opening at the level of the edge of the ventral crest. Muciferous crypts indistinct.

Mouth parts.—Teeth $\frac{2}{3}$. Upper labium fringed with a continuous row of labial teeth; the papillae extend above and inward beyond the end of the upper fringe for about one-third to three-tenths of upper fringe. The end of the second upper labial row is usually even with the end of the upper fringe. The horny beak is contained about 1.8–2.0 times in the upper fringe. The median space between the lateral second upper labial rows of short teeth, 3.25–5 in the length of either lateral row sometimes very narrow (six in lateral row). The inner papillae extend under the third row of lower labial teeth, making at least two rows across the lower labial border. In the lower labial corner there is a heavy papillary series sometimes three or four rows wide like *H. versicolor* or *H. femoralis*. The lower third labial row is long and is usually about the length of the first or second lower labial rows and longer than the horny beak. The first and second rows are about equal and one and one-half to one and three-fourths greater than the horny beak. This species, like *H. versicolor* and *H. femoralis*, has the upper fringe very angulate at the middle.

Measurements.—Length of body (10–12 mm.) in tail (16–20 mm.) 1.55–2.05, average 1.75. Width (5.0–6.6 mm.) of body in its own length 1.7–2.2, average 1.875. Depth (5.0–7.0 mm.) of body equals body width or slightly greater. Depth of body 1.5–2.2 in body length, average 1.81. Depth (6.0–8.0 mm.) of tail in length of tail 2.3–3.3, average 2.8. Muscular part (3.0–4.2 mm.) 1.5–2.33 in depth of tail, average 1.87. Spiracle 1.15–1.75 nearer base of hind legs or vent region (4.0–6.5 mm.) than the tip of the snout (6.5–8.0 mm.), average 1.47. Spiracle 1.4–2.2 nearer eye (2.8–3.5 mm.) than base of hind legs or vent, average 1.7. Eye 1.1–1.6 nearer to spiracle (2.8–3.5 mm.) than to snout (4.0–5.0 mm.), average 1.38. Nostril 1.5–2.4 nearer eye (1.2–2.0 mm.) than snout (2.8–3.5 mm.), average 1.8. Mouth (2.0–3.5 mm.) usually equal to internasal space (2.5–3.5 mm.). Mouth contained 1.1–1.8 (average 1.50) in interorbital distance (4.0–5.5 mm.). Internasal space contained in interorbital space 1.33–2.0, average 1.58.

The dimensions of the largest tadpole are:

	Mm.		Mm.
Total length.....	32.0	Spiracle to vent.....	6.5
Body length.....	12.0	Spiracle to eye.....	3.0
Body depth.....	6.5	Eye to snout.....	4.0
Body width.....	6.0	Eye to nostril.....	1.2
Tail length.....	20.0	Nostril to snout.....	3.0
Tail depth.....	6.0	Mouth.....	3.2
Masculature of tail.....	4.0	Interorbital distance.....	5.0
Spiracle to snout.....	7.5	Internasal distance.....	3.5

EXPLANATION OF PLATES

Figure 4 of Plate 5, figures 2, 9, 10, 11, and 18 of Plate 6, and figure 8 of Plate 7 are added for comparison and are not referred to in the text.

PLATE 1. MISCELLANEOUS

- FIG. 1. *Gastrophryne texensis*.
2. *Scaphiopus couchii*.
3. *Scaphiopus hammondi*.
4. *Scaphiopus holbrookii*.
5. *Gastrophryne carolinensis*.
6. *Ascaphus truei* (after Gaige).
7. *Bufo americanus*.
8. *Bufo* (Raleigh, N. C.).
9. *Bufo terrestris*.
10. *Acris gryllus*.
11. *Pseudacris* (Buffalo, Rochester, N. Y.).
12. *Pseudacris* (Raleigh, N. C.).
13. *Pseudacris ocularis*.

PLATE 2. RANA

- FIG. 1. *Rana catesbeiana*.
2. *Rana sphenocephala*.
3. *Rana palustris*.
4. *Rana aesopus*.
5. *Rana pipiens*.

PLATE 3. RANA

- FIG. 1. *Rana heckscheri*.
2. *Rana heckscheri* (young tadpole).
3. *Rana septentrionalis*.
4. *Rana boylei sierrae*.
5. *Rana sylvatica*.
6. *Rana clamitans*.
7. *Rana grylio*.

PLATE 4. HYLA

- FIG. 1. *Hyla crucifer*.
2. *Hyla gratiosa*.
3. *Hyla andersonii*.
4. *Hyla cinerea*.
5. *Hyla regilla*.
6. *Hyla squirella*.
7. *Hyla femoralis*.
8. *Hyla versicolor*.
9. *Hyla femoralis*.

PLATE 5. SUPPLEMENTARY

- FIG. 1. *Rana virgatipes*.
2. *Rana onca*.
3. *Hyla arenicolor*.
4. *Pseudacris* (San Benito, Tex.).
5. *Bufo punctatus*.
6. *Bufo compactilis*.
7. *Bufo valliceps*.

MATURE TADPOLES (ABOUT NATURAL SIZE)

PLATE 6. GASTROPHRYNE, HYPOPACHUS, SCAPHIOPUS, BUFO, ACRIS,
PSEUDACRIS. $\times 1$

- FIG. 1. *Gastrophryne carolinensis*. Trader's Hill, Ga., June 24, 1922.
 2. *Hypopachus cuneus*. San Benito, Tex., April 22, 1925. Dorsal aspect.
 3. *Gastrophryne texensis*. Beeville, Tex., April 16, 1925.
 4. *Scaphiopus hammondi*. Deming, N. Mex., July 24, 1925. $\times \frac{3}{4}$.
 5. *Scaphiopus hammondi*. Alamogordo, N. Mex., July 21, 1925. Dorsal aspect.
 6. *Scaphiopus holbrookii*. Camp Pinckney near Folkston, Ga., June 22, 1922.
 7. *Scaphiopus couchii*. Comfort, Tex., June 5, 1925.
 8. *Bufo quercicus*. Chessers Island, Folkston, Ga., August 10, 1922.
 9. *Bufo compactilis*. Leon Creek, San Antonio, Tex., May 26, 1925.
 10. *Bufo punctatus*. Helotes, Tex., June 5, 1925.
 11. *Bufo valliceps*. Lee Branch, Helotes Creek, Tex., May 26, 1925.
 12. *Bufo americanus*. Ithaca, N. Y.
 13. *Acris gryllus*. Near Chessers Island, Folkston, Ga., July 24, 1922.
 14. *Acris*. Beeville, Tex., May 14, 1925.
 15. *Acris*. Helotes, Tex., May 26, 1925.
 16. *Pseudacris ocularis*. Folkston, Ga., June 30, 1922.
 17. *Pseudacris* ———. Hilton, N. Y., June 11, 1923.
 18. *Pseudacris* ———. San Antonio, Tex., May 29, 1925.

Photograph: Nos. 2, 3, 4, 5, 7, 9, 10, 11, 12, 14, 15, 17, 18, by A. A. Wright and A. H. Wright; Nos. 1, 6, 8, 13, 16 by F. Harper and A. A. Wright.

PLATE 7. RANA. $\times 1$

- FIG. 1. *Rana aesopus*. Chessers Island, Ga., August 10, 1922.
 2. *Rana palustris*. Ithaca, N. Y.
 3. *Rana onca*. Las Vegas, Nev.
 4. *Rana sylvatica*. Ithaca, N. Y.
 5. *Rana clamitans*. Ithaca, N. Y.
 6. *Rana clamitans*. Spanish Creek, Ga., July 17, 1922.
 7. *Rana pipiens*. Ithaca, N. Y.
 8. *Rana* ———. Bandera Creek, Tex., March 11, 1925.
 9. *Rana sphenoccephala*. Folkston, Ga., July 25, 1922.
 10. *Rana sphenoccephala*. Folkston, Ga., July 10, 1922.

Photographs: Nos. 2, 3, 4, 5, 7, 8, by A. A. Wright and A. H. Wright; Nos. 1, 6, 9, 10, by F. Harper and A. A. Wright.

PLATE 8. RANA. $\times \frac{3}{4}$

- FIG. 1. *Rana heckscheri*. Callahan, Fla., July 20, 1922.
 2. *Rana grylio*. Okefinokee Swamp, Billys Island, Ga., August 5, 1922.
 3. *Rana heckscheri*, young tadpole. Thompsons Landing, St. Marys River, Ga., July 17, 1922.
 4. *Rana grylio*. Billys Island, Ga., May 11, 1921.
 5. *Rana virgatipes*. Lakehurst, N. J., May 26, 1924.
 6. *Rana septentrionalis*. Onekio, N. Y., July 14, 1923.
 7. *Rana catesbeiana*. Ithaca, N. Y. $\times \frac{3}{4}$.
 8. *Rana catesbeiana*. 1-year old tadpole. Ithaca, N. Y.
 9. *Rana catesbeiana*. 3-5 months old. Ithaca, N. Y.

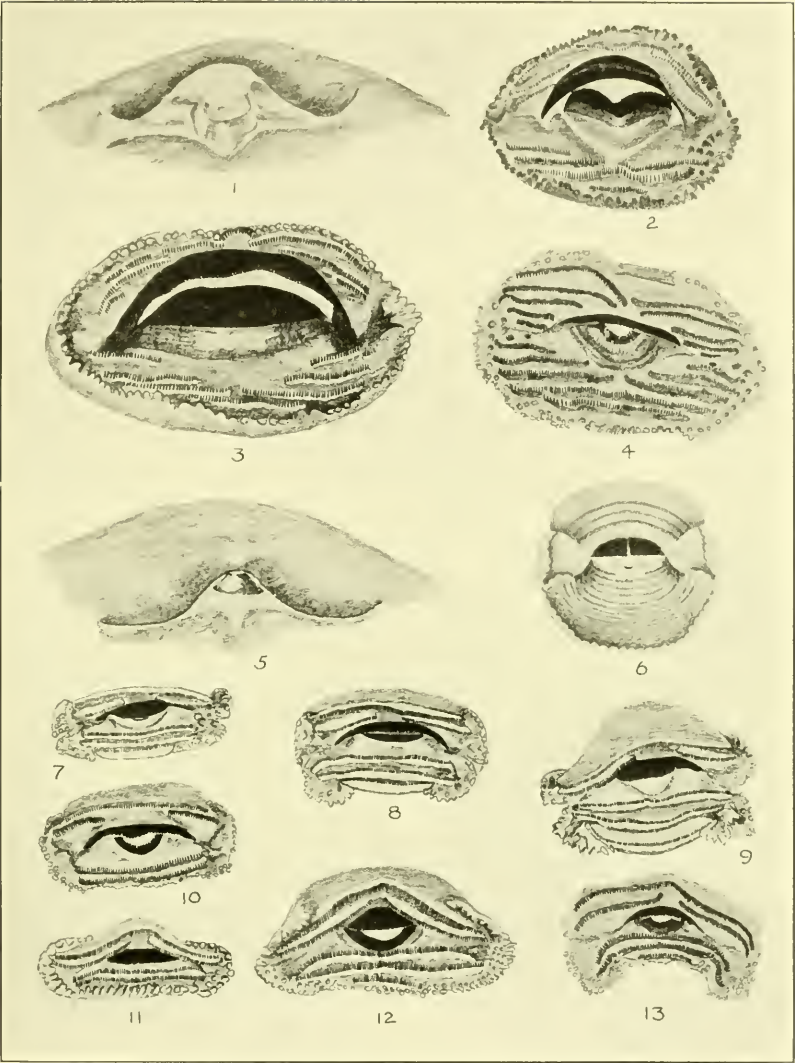
Photographs: Nos. 5, 6, 7, 8, 9, by A. A. Wright and A. H. Wright; Nos. 1, 2, 3, 4, by F. Harper and A. A. Wright.

PLATE 9. HYLAE. $\times 1$

- FIG. 1. *Hyla squirella*. Anna's Pond, Folkston, Ga., June 27, 1922.
2. *Hyla arenicolor*. Fern Canyon, Alpine, Tex., July 6, 1925.
3. *Hyla crucifer*. Ithaca, N. Y.
4. *Hyla versicolor*. Ithaca, N. Y.
5. *Hyla versicolor*. Camp Pinckney, Folkston, Ga., June 22, 1922.
6. *Hyla femoralis*. Folkston, Ga., June 27, 1922.
7, 8. *Hyla andersonii*. Lakehurst, N. Y., June 28, 1923.
9. *Hyla gratiosa*. Petty Pond, Folkston, Ga., July 31, 1922. $\times 1.2$.
10. *Hyla gratiosa*. Young tadpoles. Traders Hill, Ga., June 24, 1922.
11. *Hyla gratiosa*. Forked tail.
12. *Hyla cinerea*. Camp Pinckney, Folkston, Ga., August 12, 1922.

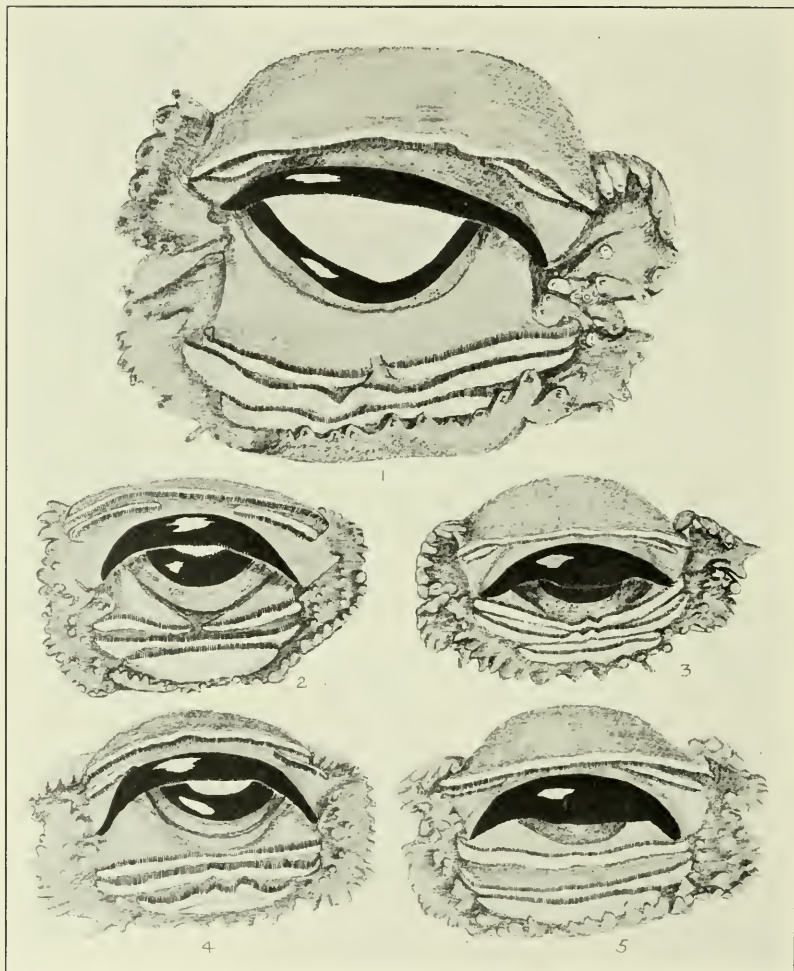
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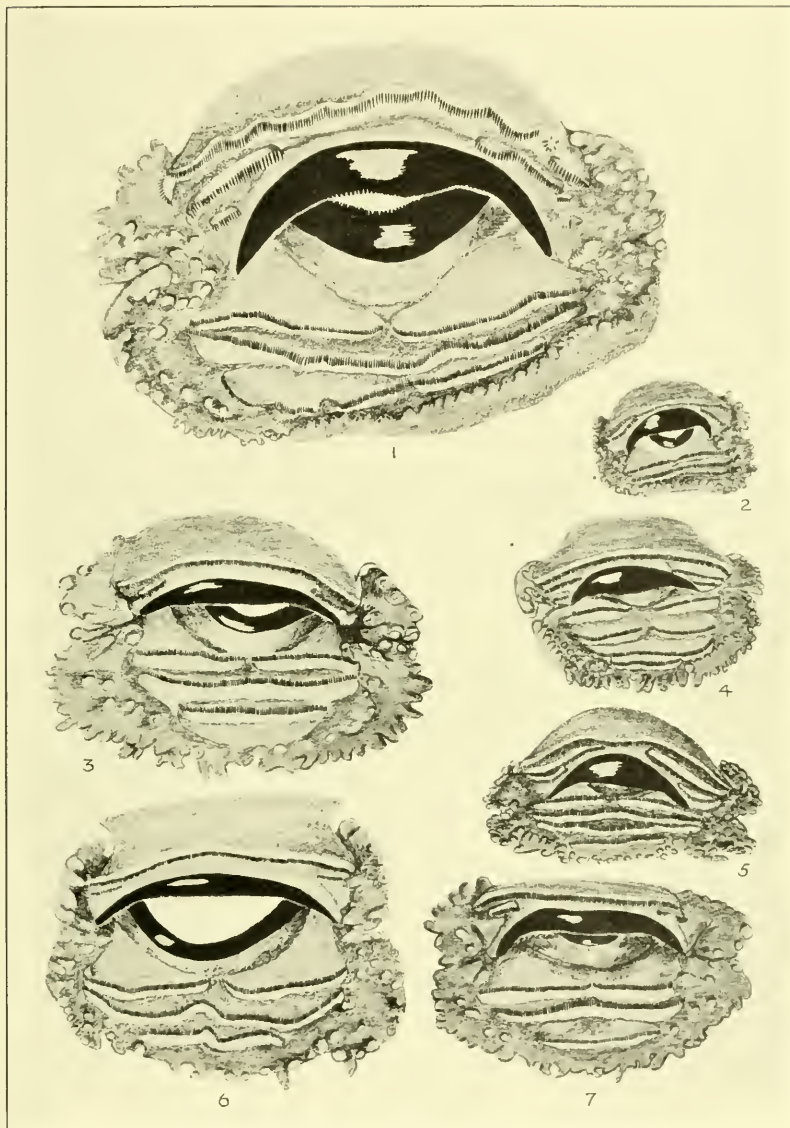
MOUTH PARTS OF NORTH AMERICAN TADPOLES

FOR EXPLANATION OF PLATE SEE PAGE 68



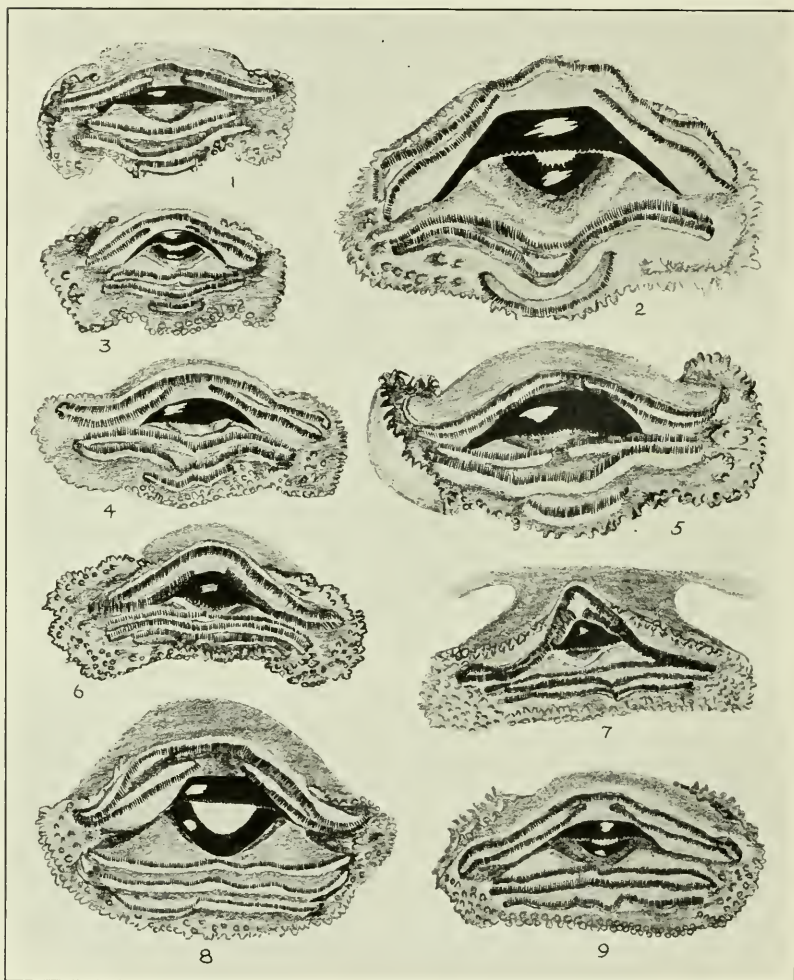
MOUTH PARTS OF NORTH AMERICAN TADPOLES

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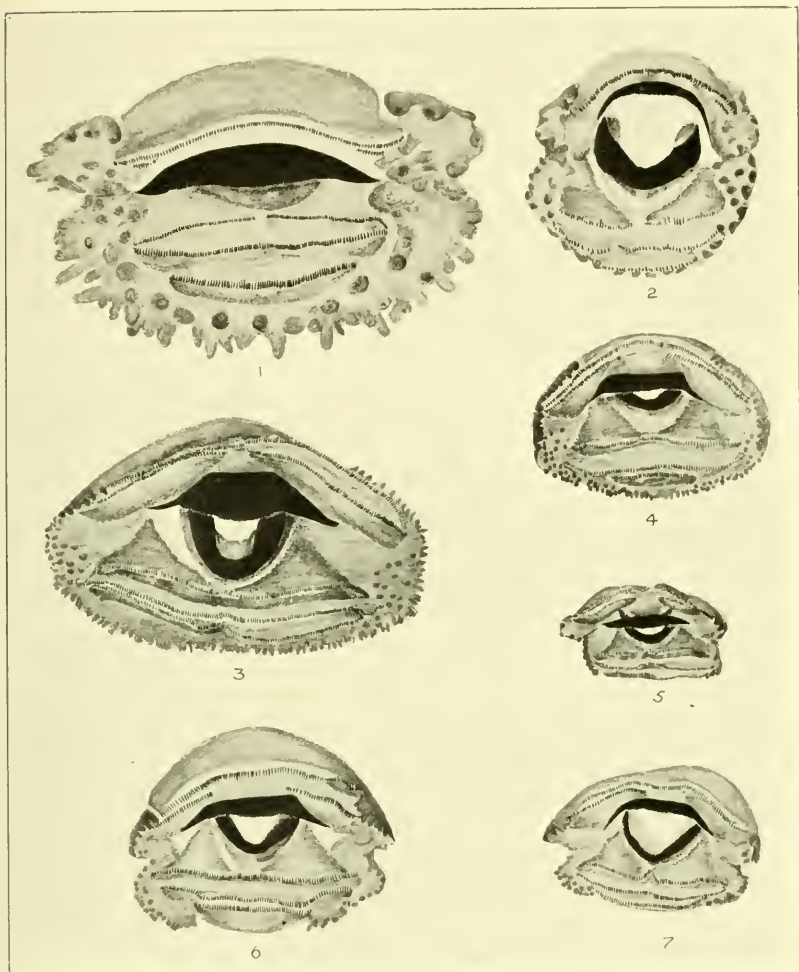
MOUTH PARTS OF NORTH AMERICAN TADPOLES

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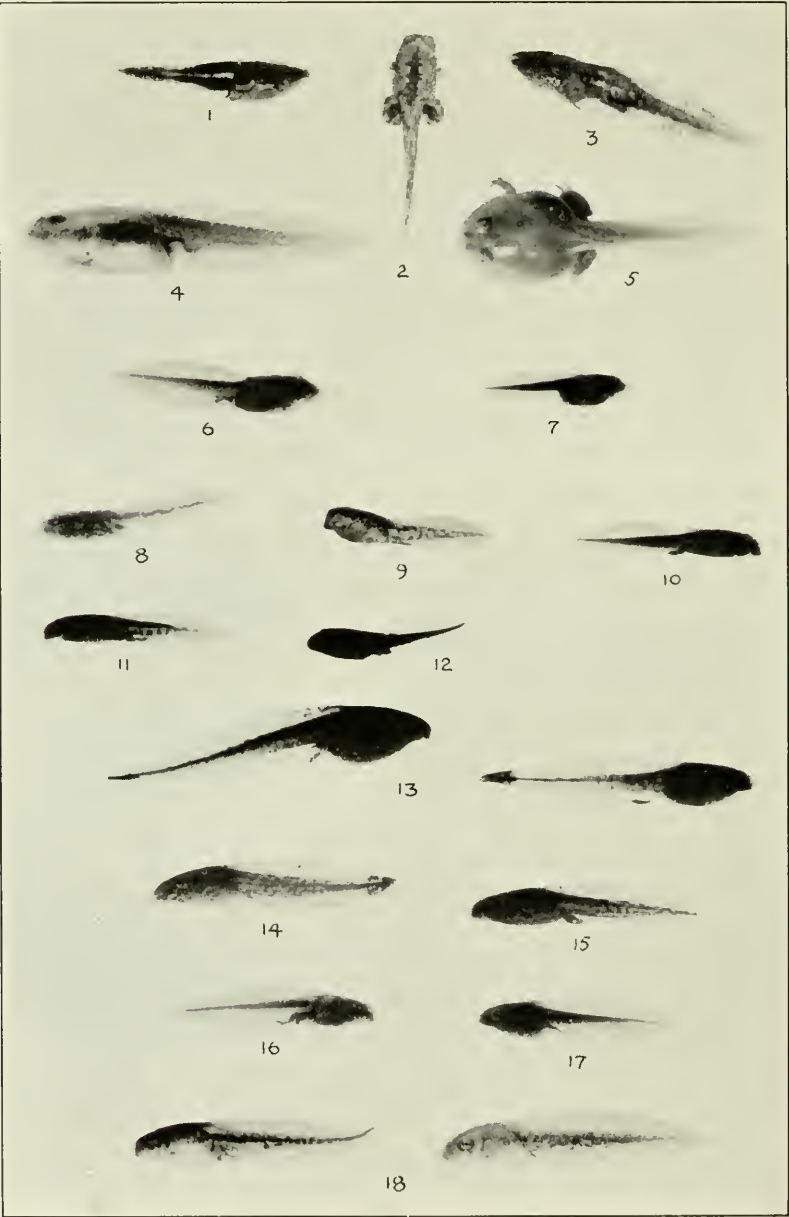
MOUTH PARTS OF NORTH AMERICAN TADPOLES

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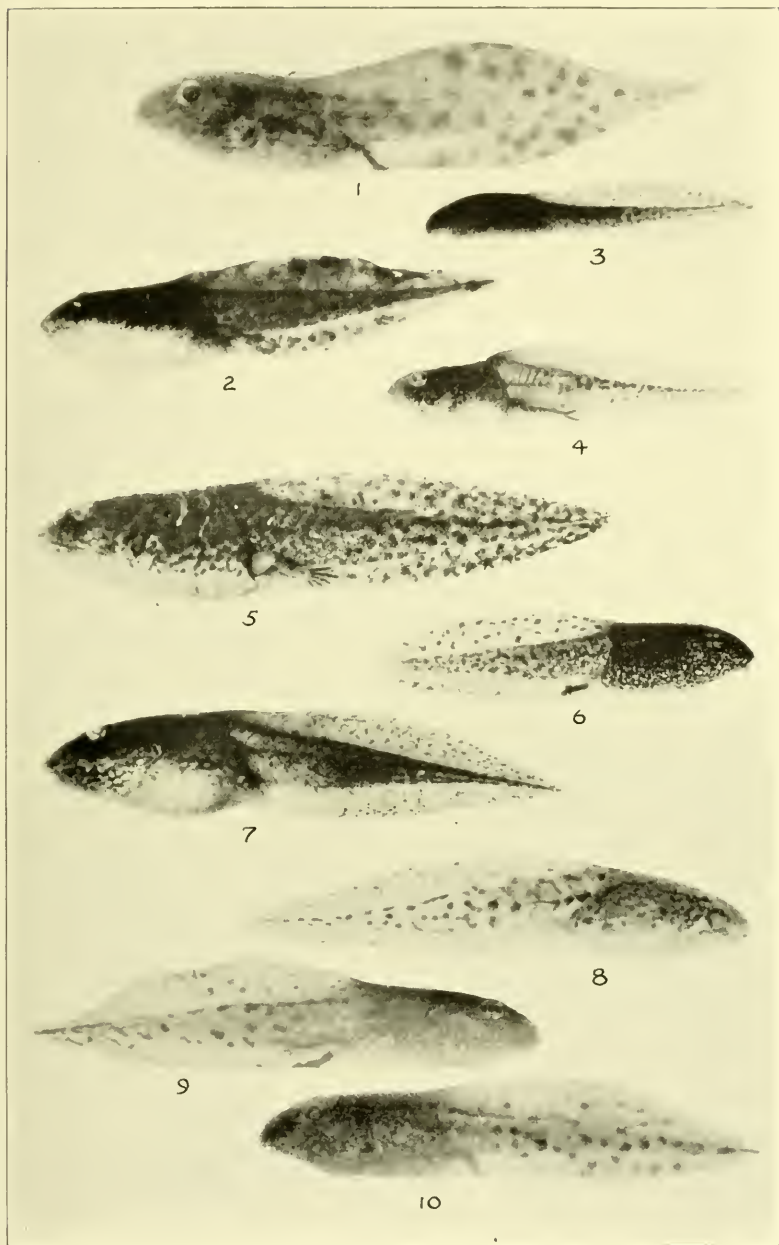
MOUTH PARTS OF NORTH AMERICAN TADPOLES

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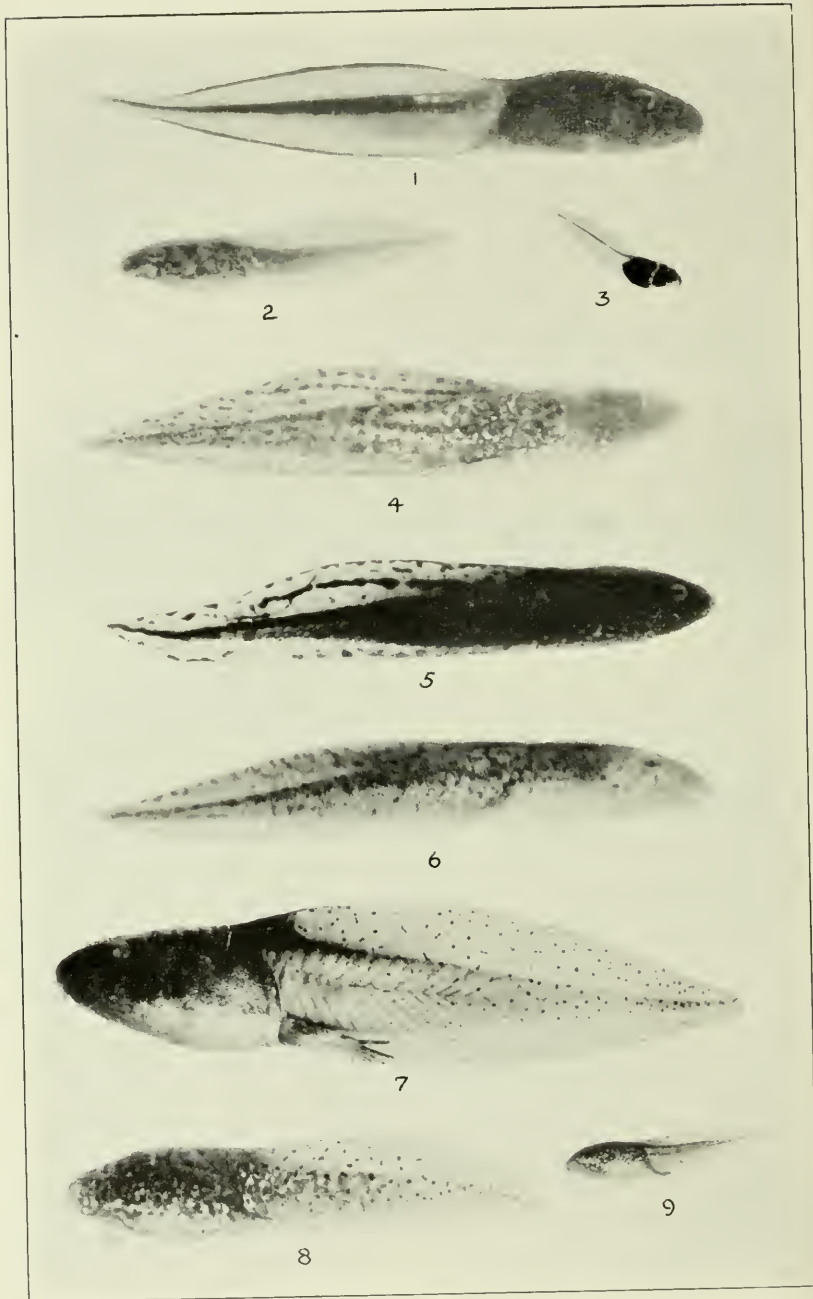
LATERAL ASPECTS OF LIVE TADPOLES

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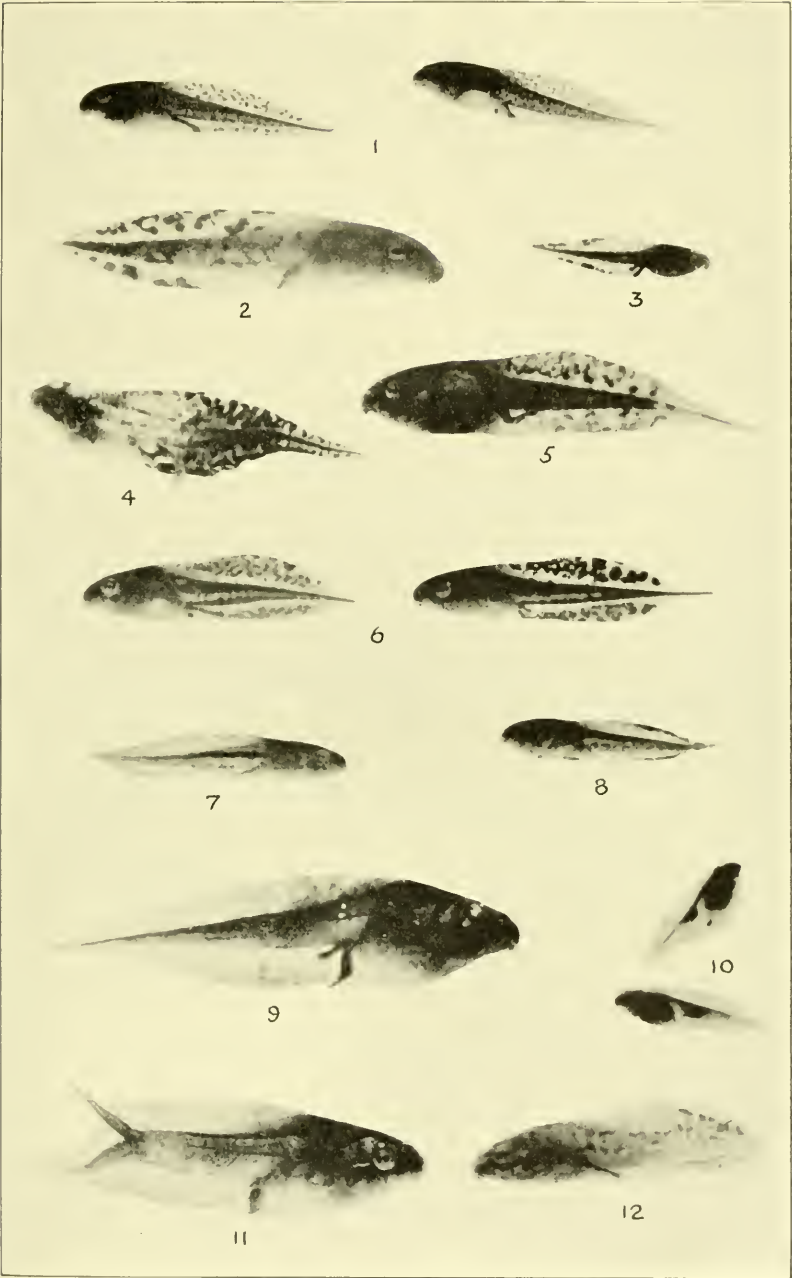
LATERAL ASPECTS OF LIVE TADPOLES

FOR EXPLANATION OF PLATE SEE PAGE 69



LATERAL ASPECTS OF LIVE TADPOLES

FOR EXPLANATION OF PLATE SEE PAGE 69



LATERAL ASPECTS OF LIVE TADPOLES

FOR EXPLANATION OF PLATE SEE PAGE 70



A NEW POLYCHAETOUS ANNELID OF THE GENUS PHYLLODOCE FROM THE WEST COAST OF COSTA RICA

By AARON L. TREADWELL

Of the Department of Zoology, Vassar College, Poughkeepsie, N. Y.

In August, 1927, a small collection of invertebrates from the Gulf of Nicoya was sent to the United States National Museum by Professor Manuel Valerio of the Lyceum of Costa Rica, for identification. Included in this material was a polychaetous annelid, here described, which appears to be new to science.

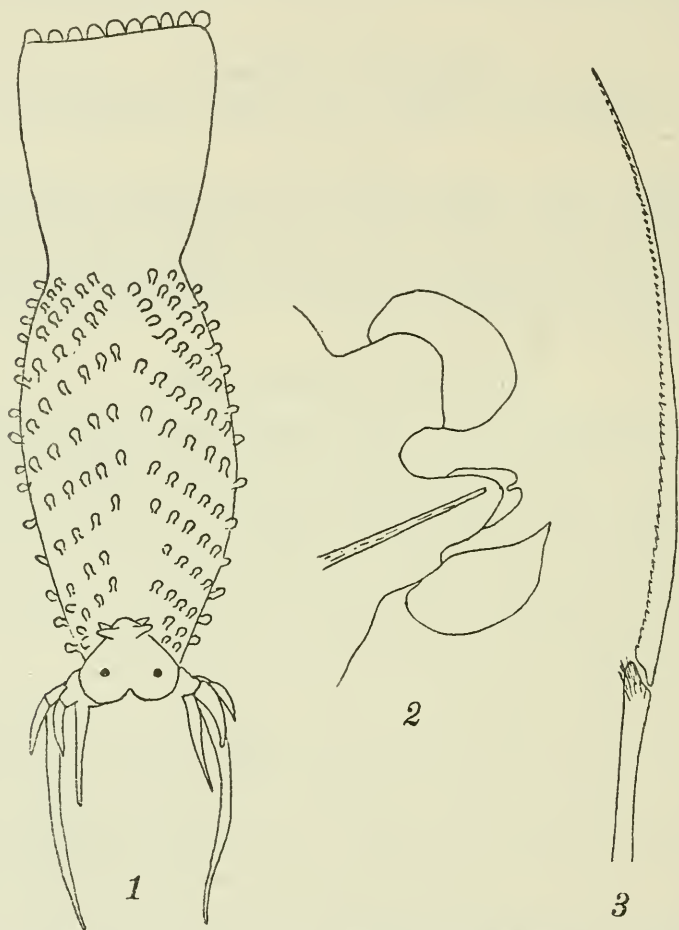
PHYLLODOCE NICOYENSIS, new species

Of the three specimens in the collection, only one is not badly coiled. This is 90 mm. long, about 0.5 mm. wide at the prostomium, and 1.5 mm. wide in the region of the fifteenth somite. So far as can be determined in their coiled condition the others are approximately the same length. None is entire posteriorly, but all show a gradual tapering in width behind the fifteenth somite. In preserved material the body color is an iridescent purple, the parapodia, prostomium, peristomium, and tentacular cirri light brown.

The anterior margin of the prostomium (fig. 1) is only very slightly rounded and from the bases of the tentacles each lateral margin slopes latero-posteriorly at an angle of about 45° as far as the level of the eyes. Here it bends forming the rounded latero-posterior prostomial angle. The posterior prostomial margin has the usual median incision, in which is a very small and inconspicuous papilla. The eyes are small and black, situated at about one quarter of the length of the prostomium from its posterior border. The tentacles are short and stout, about as long as the distance between those of opposite sides. The first tentacular cirrus and the ventral one on somite 2 are about equal in size and extend as far posteriorly as somite 5. The dorsal one on somite 2 extends to somite 8 and the one on somite 3 to somite 12.

In two of the three individuals the proboscis is protruded. The proximal portion of the proboscis, extending rather more than one-

half its length, is much thinner walled and of greater diameter than the distal, though it is possible that this may be in part due to the preserving fluids. Rounded brown colored papillae (fig. 1) are distributed over the surface of this proximal portion. Dorsally, some eight rows of these papillae start at equal intervals on either side of the mid line, each row running in a postero-lateral direction



FIGS. 1-3.—*PHYLLODOCE NICOXENSIS*, NEW SPECIES; 1, PROTHORAX AND PROBOSCIS $\times 7.5$; 2, PARAPODIUM $\times 22.5$; 3, SETA $\times 250$

around the proboscis. The anterior ones of these rows are the longest and meet from opposite sides on the mid-ventral lines. The more posterior ones being shorter, end at the posterior margin of the proboscis. Other short rows start from the circumference of the end of the proximal region, those of opposite sides meeting in the mid-ventral line. At the anterior end of this mid-ventral line is a clear space, containing a few scattered papillae. The distal portion

of the proboscis is broadest at the apex, and has on either side three not very prominent longitudinal ridges. Its terminal margin carries 18 lobes.

The parapodia (fig. 2) are similar in form throughout the body, differing only in that the most anterior ones are very small. The setal lobe has the usual arrangement of a bifid presetal and a rounded postsetal lip, the latter the shorter. The dorsal cirrophore has nearly twice the vertical diameter of the setal lobe and is two-thirds as long as it is. The cirrus is small and inconspicuous. The ventral cirrophore is a rounded elevation at the base of the setal lobe. The ventral cirrus is broadly rounded on its ventral margin and distally bends upward and outward to meet the dorsal at an acute angle. The dorsal margin is in general horizontal, but is more or less wavy in contour. The apex of the ventral cirrus extends a little beyond that of the setal lobe, and it is shorter than the dorsal cirrus. The setae differ from one another only in size, the swollen apex of the shaft carrying numerous spines (fig. 3). The distal portion is long, slender, and slightly bent, and has numerous denticulations along the concave surface. The holotype (Cat. No. 19244 U.S.N.M.) was taken in the Gulf of Nicoya, Costa Rica.





TSCHERMIGITE, AMMONIOJAROSITE, EPSOMITE, CELESTITE, AND PALIGORSKITE FROM SOUTHERN UTAH

By EARL V. SHANNON

Assistant Curator of Geology, United States National Museum

INTRODUCTION

During the summer of 1927 Mr. Frank Haycock, of Panguitch, Utah, sent a lot of specimens to the United States National Museum for identification. These proved of such interest that additional material was requested and Mr. Haycock generously responded by sending a second lot. The minerals recognized were tschermigite, the rare ammonia alum, ammoniojarosite, a new member of the jarosite group in which ammonium oxide replaces the potash of jarosite, epsomite, celestite, and a mountain cork or paligorskite. Later another lot of specimens of the associated paligorskite and celestite was sent independently for identification by Mr. M. J. Proctor, also of Panguitch. These minerals have all been studied in the Museum laboratory and the results of the examinations are given below.

OCCURRENCE

Following preliminary examination of the minerals and their identification, a report was rendered the sender and he was asked to give the locality from which the material came. This was considered desirable before any detailed work was done on the minerals as the associated tschermigite and ammoniojarosite in lignitic shale were identical in appearance with the tschermigite and associated jarosite from Wamsutter, Wyo., described by Erickson¹ and it was thought that they might have been brought from the Wyoming locality. Mr. Haycock, in his reply, said that, inasmuch as he thought the deposit might have some commercial value, he did not wish to divulge its exact whereabouts until he had an opportunity to file mining claims to cover the occurrence. He assured me, how-

¹ E. Theodore Erickson. Tschermigite (ammonia alum) from Wyoming. Journ. Wash. Acad. Sci., vol. 12, No. 13, pp. 49-54, 1922.

ever, that it was in southern Utah and thus about 300 miles, air line, from the Wyoming occurrence. His description of the occurrence is as follows:

The tschermigite and jarosite occur intermingled at the top of a butte on the top of a hard sandstone bluff 200 feet high. The mineral-bearing structure is approximately 100 feet high with a more or less rounded contour 1,500 feet in diameter. It is located 20 miles from the nearest good road * * *. Will say that this deposit lies on the western slope of the Kaibab (also called variously Pahreah, Potato Valley, or Kaiparowitz) fault. The top of the butte is covered with about 1 foot of the "egg-shell" stuff which is being sent you. Additional samples of the minerals are also being sent.

Of the samples received as associated material, the most abundant is a grayish clay which contains obscure fragments of what may be plant remains. This disintegrates in water in a manner suggesting that it is largely bentonitic in character. Scattered through the samples and intimately associated with the ammoniojarosite are some obscure fossils which were provisionally identified as *Ostrea glabra* and *Corbula perundata* by Dr. John B. Reeside. These fix the age of the beds as upper Cretaceous.

The paligorskite and celestite are inclosed in friable red sandstone similar to that of the Triassic "Red Beds."

DESCRIPTION OF THE MINERALS

TSCHERMIGITE

The ammonia alum, tschermigite, was first described by Beudaunt under the name "ammonalaun"² as occurring in fibrous veins in the lignite of Tschermig in Bohemia. The name tschermigite was given to the substance by von Kobell in 1853. Aside from the Tschermig locality and one in a mine at Dux, also in Bohemia, the mineral has been more recently described as occurring in cubic crystals at a mine in Brux, Bohemia, by Sachs.³ In all of the Bohemian localities the mineral is associated with lignitic coal. It has also been found as a volcanic sublimate at Mount Etna and at Solfatara at Puzzuoli.

The first American occurrence of the ammonium alum noted was 3 miles south of Wamsutter, Wyo. This material has been analyzed and described by Erickson.⁴ The mineral occurs in a 6-foot bed of lignitic shale and the ledge is traceable along the brink of the hills for nearly 3 miles. The tschermigite forms fibrous veins and cements shale fragments, nodules of yellow jarosite, and a few scattered gypsum crystals.

² Traite de Mineralogie, vol. 2, p. 497, 1832.

³ Centralbl. Mineralogie, 1907, p. 465.

⁴ E. Theodore Erickson. Journ. Wash. Acad. Sci., vol. 12, pp. 49-54, 1912.

The Utah mineral is so similar in appearance and associations to that from Wyoming that, were specimens from the two localities mixed it would be impossible to separate them. Like those described by Erickson the Utah specimens consist of fibrous veins up to 1 centimeter thick, of glassy transparent tschermigite cementing fragments of lignitic shale and nodules of yellow jarositic material. People familiar with the Wyoming specimens insisted that the Utah material must be from the same locality but, aside from the other evidence, this is disproven by the upper Cretaceous fossils in the Utah specimens. The Wyoming mineral occurs in the Wasatch formation of lower Eocene age and the tschermigite-bearing bed is immediately below the upper Eocene Green River shale.

The veinlets of Utah tschermigite seldom exceed 1 centimeter in thickness, and most of them are much thinner than this in the specimens at hand. The mineral is transparent, colorless, and glassy, with only an indistinctly fibrous structure or appearance, which is mostly due to canals or elongated cavities in one direction across the veins. Ample material was available for analysis. After washing with alcohol and drying in air a 2.5-gram sample was weighed out, dissolved in water, and filtered. The insoluble material was chiefly lignite, which was weighed after air-drying for several days. The solution, made up to definite volume, was divided into aliquot portions, each equivalent to one-half gram of sample. All constituents except water were determined on these portions. Ammonia was determined by the addition of an excess of potassium hydroxide and distilling the liberated ammonia into a measured volume of standard acid, the excess of acid being titrated with standard alkali in the usual manner. The other constituents were determined by the customary methods. The analysis gave the following results:

Analysis of tschermigite from Utah

(Earl V. Shannon, analyst)

	Per cent
Insoluble (lignite, etc.)	0.04
Al ₂ O ₃	11.86
Fe ₂ O ₃	Trace.
CaO	.10
MgO	.28
Na ₂ O	.48
K ₂ O	.25
(NH ₄) ₂ O	4.78
Cl	.04
SO ₃	35.78
H ₂ O above 110° C	21.68
H ₂ O below 110° C	25.16
	<hr/> 100.45

After standing a year in the laboratory the mineral is still clean, fresh, and glassy and exhibits no tendency to alteration or dehydration. Under the microscope the analyzed material was pure and uniformly isotropic with an index of refraction of 1.460. The specimens exhibit no crystal faces, the free ends of the fibers being in most cases somewhat dissolved or corroded. For comparison several previous analyses of tschermigite from other localities, including Erickson's analysis of the Wyoming material are given in the following table:

Previous analyses of tschermigite

	1	2	3	4
Al ₂ O ₃	11.57	11.28	11.40	11.39
(NH ₄) ₂ O.....	5.23	5.74	5.86	5.62
Na ₂ O.....	.21			
K ₂ O.....	Trace.		.06	.17
MgO.....	.13			
SO ₃	35.11	35.33	34.99	35.14
H ₂ O.....	47.82	47.65	47.69	47.59
Insoluble.....	.06			.08
Fe ₂ O ₃ , CaO, Cl.....	Trace.			.01
	100.13	100.00	100.00	100.00

1. Average analysis of tschermigite from Wyoming. E. T. Erickson, analyst. Journ. Wash. Acad. Sci., vol. 12, p. 50, 1922.

2. Composition for formula $\text{Al}_2(\text{SO}_4)_3 \cdot (\text{NH}_4)\text{SO}_4 \cdot 24\text{H}_2\text{O}$.

3. Tschermigite from Dux, Bohemia. J. V. Duchmuller, analyst, Centr. Min. Geol., 1907, pp. 465-467.

4. Tschermigite, from Brux, Bohemia. A. Sachs, analyst, Centr. Min. Geol., 1907, pp. 465-467.

AMMONIOJAROSITE

A preliminary paper announcing ammoniojarosite as a new mineral has already been published by the writer.⁵ Jarosite is a hydrous ferric-iron-potash sulphate which has been known since 1838. It is widespread in occurrence and has been identified at a large number of localities. The large content of ferric iron gives it a brown color, and, although occasionally lustrous transparent crystals a millimeter or two in diameter are found, the usual form of the mineral is a friable earthy-appearing mass of fine grained silky lustered material. It greatly resembles earthy or ocherous limonite but, when examined microscopically, it is found to consist of loose aggregates of microscopic transparent crystals which are tabular rhombohedral in form. Its resemblances to limonite have often caused it to be overlooked and many occurrences have doubtless failed of recognition for this reason.

Sixty-four years after the description of the original potash jarosite Hillebrand and Penfield⁶ described two new members of the group. In the first of these potash is replaced by soda, a very ordinary instance of the substitution of one alkali for another, and the mineral was named natrojarosite. In the other, however, the somewhat surprising situation was found wherein the univalent potassium oxide

⁵ Earl V. Shannon. Ammoniojarosite, a new mineral of the jarosite group from Utah. Amer. Mineralogist, vol. 12, No. 12, pp. 424-426, 1927.

⁶ W. F. Hillebrand and S. L. Penfield. Amer. Journ. Sci., vol. 14, p. 211, 1902.

was replaced by the oxide of a heavy bivalent metal, lead, and the mineral was named plumbojarosite. In the hand specimen these two new members of the group had the same appearance as ordinary jarosite, from which they can not be distinguished without chemical tests, although the lead member may be recognized by its higher specific gravity in some specimens. Numerous examples appear to exist isomorphously intermediate between the plumbojarosite, natrojarosite, and jarosite. Plumbojarosite carries sufficient lead to have been smelted in several instances as an ore. Utahite, vegasite, and several other supposedly distinct species have been found to be identical with one or the other of the above minerals.

Still more recently a jarosite mineral very rich in silver from the Tintic district in Utah has been examined by Schaller⁷ and found to have silver oxide as the essential base in place of potash. To this interesting mineral, the first known in which silver enters as an oxygen compound, the name argentojarosite was given. This, again, had superficially all of the characteristics of ordinary jarosite. Since such unexpected cases of isomorphism in this group it is hard to predict what others may be found. In the Boss mine in Nevada a small amount of plumbojarosite was mined which carried comparatively large amounts of platinum and palladium.⁸ These apparently were not entirely present as the native metals and the platinum and palladium may have replaced the lead of the plumbojarosite. The jarosites are essentially minerals of arid climate. Although occurring in numerous localities where sulphides have oxidized in dry regions, the minerals of the group are almost unknown in areas of more humid climate.

Erickson⁹ described jarosite occurring associated with the tschermigite from Wyoming as coating or sometimes inclosed in the alum and also in pure nodular masses. It was pale yellow in color and fine grained, but the individual crystals could be recognized under the highest magnifying power of the petrographic microscope. Since an ammonia member of the jarosite group was anticipated the ammonia content of this Wyoming material was determined and found to be 1.30 per cent $(\text{NH}_4)_2\text{O}$, or 1.25 per cent when corrected for included tschermigite. Although an ammoniacal variety, this obviously did not closely approach the ammonia end member of the group. With Erickson's results in mind, the present writer very carefully examined the jarosite associated with the Utah tschermigite and upon analysis this was found to contain a definite preponderance of am-

⁷ Waldermar T. Schaller. Argentojarosite, a new silver mineral. Preliminary note. Journ. Wash. Acad. Sci., vol. 13, No. 11, p. 233, 1923.

⁸ Adolph Knopf. A gold-platinum palladium lode in southern Nevada. U. S. Geol. Survey Bull. 620, pp. 1-18, 1916.

⁹ E. Theodore Erickson. Journ. Wash. Acad. Sci., vol. 12, pp. 49-54, 1922.

monia over soda and potash. Consequently it has been given the name ammoniojarosite. Thus five definite members of the jarosite group are now known, having the following formulas:

Jarosite,	K_2O ,	$3Fe_2O_3, 4SO_3, 6H_2O$.
Natrojarosite,	Na_2O ,	$3Fe_2O_3, 4SO_3, 6H_2O$.
Plumbojarosite,	PbO ,	$3Fe_2O_3, 4SO_3, 6H_2O$.
Argentojarosite,	Ag_2O ,	$3Fe_2O_3, 4SO_3, 6H_2O$.
Ammoniojarosite	$(NH_4)_2O$,	$3Fe_2O_3, 4SO_3, 6H_2O$.

These minerals form a division of the large alunite-beudantite series of minerals as defined by Schaller¹⁰ and numerous other related compounds are to be expected. Ammoniojarosite and argentojarosite, the two newest members of the group, have their type localities in Utah and all of the known members of the group have been found in that State.

The Utah ammoniojarosite forms small, soft, ocherous lumps of pale yellow color and darker hard, irregular, flattened nodules up to 4 centimeters broad by 5 millimeters thick, embedded in blackish-brown lignitic material. Some of it is stained darker brown by limonite and a little occurs in shaly masses largely composed of the imperfect Cretaceous fossils mentioned above. On fresh fracture the color of most of the purer lumps is light ocherous yellow and the luster is dull-waxy to earthy.

One of the largest and purest lumps was selected and freed as far as possible from adhering lignite. This was finely ground and digested with frequent stirring in hot distilled water long enough to remove all tschermigite and other water-soluble salts. It was then filtered out of suspension, washed thoroughly with hot water, dried in air, reground, and allowed to stabilize its water content in air for several days. The powder was then analyzed by standard methods. Five grams were weighed out, dissolved in hot hydrochloric acid and filtered. The undissolved material was dried in air for several days and then weighed, after which it was ignited and again weighed. It consisted principally of lignite with a very little clayey material. The solution was made up to 500 cc. and divided into 5 aliquot parts. On these portions, equivalent to 1 gram of sample each, the constituents other than water and ammonia were determined. Water and ammonia were determined by standard methods on separate portions of the same powder. The analysis gave the following results and ratios:

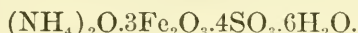
¹⁰ Waldemar T. Schaller. The alunite-beudantite group. U. S. Geol. Survey Bull. 509, pp. 70-76, 1912.

Analysis and ratios of ammoniojarosite

(Earl V. Shannon, analyst)

	Per cent	Ratios	
Insoluble.....	0.76		
TiO ₂	Trace.		
Al ₂ O ₃.....	.02	0.0001	
Fe ₂ O ₃	49.30	.309	0.309 0.103×3
CaO.....	.05	.001	
MgO.....	.13	.003	
Na ₂ O.....	.22	.004	
K ₂ O.....	1.56	.017	.106 .106×1
(NH ₄) ₂ O.....	4.23	.081	
PbO.....	Trace.	-----	
Ag ₂ O.....	None.	-----	
SO ₃	34.49	.431	.108×4
H ₂ O.....	9.86	.547	.091×6
	100.62		

Except in that the water content is a little low the results agree very well with the formula



The existence of the ammonia member of the group is thus established. The theoretical composition to satisfy the above formula is: (NH₄)₂O 5.43; Fe₂O₃ 49.92, SO₃ 33.38, and H₂O 11.27 per cent.

Under the microscope the analyzed sample was found to be made up of minute transparent tabular grains, a few of which showed hexagonal outline. These were too small to yield an interference figure, but those lying on the basal plane are dark between crossed nicols, so the mineral is uniaxial or nearly so. Plates on edge show positive elongation, so the mineral is probably optically negative. The refractive indices could not be accurately measured but they are approximately $\omega=1.800$, $\epsilon=1.750$ both ± 0.005 . The ammoniojarosite has probably been formed through the oxidation of pyrite in the lignitic material.

EPSOMITE

One lot of material, when received, consisted of long-fibrous masses and shorter fibers having a pearly or silky luster. This gave the qualitative reactions of epsomite. The only impurity in this material was a little bentonite, and fragments of the epsomite occur in another sample of the bentonite, indicating that the magnesium sulphate occurs associated with the bentonitic clay and not in the lignite which carries the tschermigite and ammoniojarosite. When received this fibrous epsomite was lustrous and firm. Microscopic examination was fortunately made immediately after the samples were received before any dehydration had begun. The mineral was biaxial and negative with 2E medium small. The grains are lath-shaped and showed parallel extinction. They lie on either one of

two cleavages, presumably parallel to the prism (110) and the pinacoid (010). The acute bisectrix is perpendicular to the latter cleavage and the axial plane is across the elongation, so that the long direction of the fibers is Y. The dispersion, $r < v$ is strong and the mean index of refraction, β , is 1.455. These are essentially identical with the properties given by Larsen¹¹ for epsomite, $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$ as determined on the freshly crystallized salt. Almost immediately, however, the material began to dehydrate and become chalky and opaque-looking on the outside and this dehydration proceeded until when analyzed after having been exposed for a year to the air of the museum the whole lot was dead and lusterless and exceedingly fragile and friable. Since several examples of epsomite which had naturally dehydrated in the open air have recently been shown to consist of the material called hexahydrate¹² some interest attached to the analysis of the altered Utah material. A sample was accordingly analyzed with the following results:

Analysis of air dried epsomite

(Earl V. Shannon, analyst)

	Per cent	Ratios		Per cent	Ratios
Insoluble (clay) ..	1.75		H ₂ O	32.72	1.816 0.605×3 1.05×3
MgO	21.16	0.525 0.525×1 0.91×1...	CO ₂	None.	
Al ₂ O ₃ .....	.10		Cl .....	.04	
Fe ₂ O ₃	Trace.		(NH ₄) ₂ O	None.	
CaO .....	.42		SO ₃	43.38	.542 .542×1 .94×1
Na ₂ O .....	.28				
K ₂ O	Trace.			99.85	

These results show that the material has been dehydrated to a degree where the composition approximates the formula $\text{MgSO}_4 \cdot 3\text{H}_2\text{O}$. Under the microscope this analyzed powder was found to be very finely crystalline granular with the grains were too small to yield a definite interference figure although very hazy and questionable figures appear to indicate a biaxial negative mineral with 2V medium. The refractive indices are variable, but the mean index is about 1.490. This powder, when exposed to dry air in a desiccator over calcium chloride for 40 hours did not change in weight. Heated for six hours at 110° C. the powder lost 22.90 per cent and the sample thus dehydrated regained 1.10 per cent on standing three weeks over calcium chloride.

A second specimen of the lot was unlike the fibrous epsomite in appearance and was granular, translucent, and white in color. It was readily soluble in water and by qualitative tests was proven to

¹¹ Esper S. Larsen, Microscopic determination of the nonopaque minerals. U. S. Geol. Survey Bull. 679.

¹² T. L. Walker and A. L. Parsons. Hexahydrate from Oroville, Wash., U. S. A., Univ. Toronto Geol. Series No. 24. Contributions to Canadian mineralogy, 1927, p. 21.

be a hydrous magnesium sulphate free from ammonia, potash, chlorine, and carbon dioxide. Under the microscope this was seen to consist of small equidimensional euhedral crystals loosely aggregated. These lie on faces either perpendicular to Y or to an optic axis. They are biaxial and negative with $2E$ medium small, dispersion weak. The indices of refraction are $\alpha=1.430$, $\beta=1.455$, $\gamma=1.460$. These optical properties indicate that this material at the time of examination was also, epsomite and this also has altered completely and the specimen has fallen to pieces. It was not analyzed.

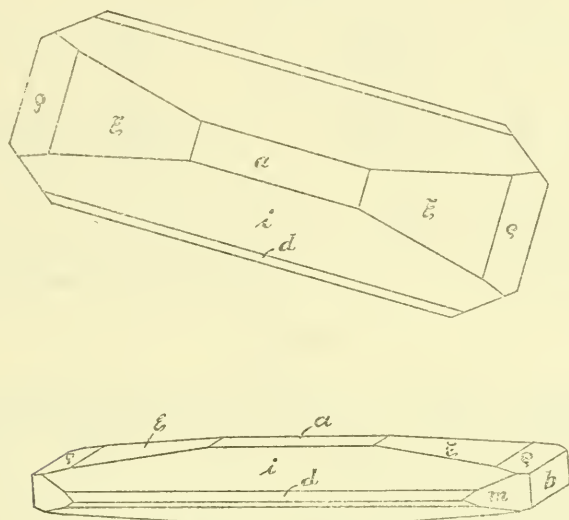


FIG. 1.—CELESTITE CRYSTAL. PANGUITCH, UTAH

CELESTITE

Celestite does not occur immediately associated with the epsomite and ammonia bearing sulphates but is a constituent of separate specimens made up of celestite and paligorskite in friable red sandstone. Some of the specimens consist almost entirely of massive-granular celestite with very little paligorskite and others are paligorskite free from celestite. The best specimens are of a vein in sandstone which has an open cellular filling of mixed paligorskite and celestite. The celestite is later than the paligorskite and some of the smaller celestite crystals which are supported by the fibers are doubly terminated. They range from 1 millimeter to 2 centimeters in length although the larger ones show parallel growth and are curved and imperfect. The smaller transparent and more perfect crystals have the habit shown in figure 1 and are tabular from the development of very flat domes, and elongated parallel to the b axis. The larger and less perfect crystals are similar but the

prism faces $m(110)$ are extended to a point eliminating the pinacoid face $b(010)$. The optical properties are the normal ones for celestite, and the mineral gives the characteristic blowpipe reactions and strontium flame. The crystal measured gave the following angles:

Measurements of celestite, Figure 1

Form		Symbol		Quality description	Measured			Calculated		
No.	Letter	Gdt.	Miller		ϕ	ρ		ϕ	ρ	
					ϕ	ρ	ϕ	ρ	ρ	ρ
1	c	0	001	Medium		0 00		0 00		0 00
2	m	∞	110	do.	52 01	90 00	52 00	90 00	90 00	90 00
3	m	∞	110	Poor	52 00	90 20	52 00	90 00	90 00	90 00
4	ξ	$0\frac{1}{2}$	0. 1. 12	Blurred, rounded	0 12	5 17	0 00	6 06	6 06	6 06
5	ρ	$0\frac{1}{8}$	018	Narrow, faint	0 00	10 10	0 00	9 06	9 06	9 06
6	l	$\frac{1}{40}$	102	Good	90 10	39 47	90 00	39 23	39 23	39 23
7	l	$\frac{1}{40}$	102	do.	90 01	39 33	90 00	39 23	39 23	39 23
8	d	$\frac{1}{40}$	104	Medium	90 10	22 10	90 00	22 19	22 19	22 19
9	d	$\frac{1}{40}$	104	do.	90 01	22 25	2 00	22 19	22 19	22 19

Even the smaller crystals are somewhat imperfect and do not give good measurements. The minerals of the veins do not penetrate the adjacent sandstone which appears unaltered and is scarcely cemented.

PALIGORSKITE

Paligorskite is an old name used to indicate matted fibrous and very light felted material of the character of "mountain cork" when in masses and "mountain leather" when in thin sheets. Most of the material so designated may have been merely a structure phase of ordinary fibrous or asbestiform tremolite or possibly in some cases serpentine of the chrysolite variety. Much of the material included under this classification has been known to contain considerable water and for this reason paligorskite has been considered an altered and hydrated asbestiform amphibole. Fersmann¹³ in describing a specimen of the mineral from Russia attempted to interpret the collected analyses by postulating a "paligorskite group" made up of variable isomorphous mixtures of two end members, namely:



Like too many theories as to the chemical constitution of the silicate minerals, this appears to lack sufficient proof to make it readily acceptable and, inasmuch as many of the analyses are old and not made upon microscopically studied material they doubtless include both inaccurate analytical work and analyses made on inhomogeneous materials. It seems certain that many mountain corks are really

¹³ A. E. Fersmann. Min. Inst. Univ. Moscow. Bull. Acad. Imp. St. Petersburg, 1908. pp. 255-274, Chem. Abstr., vol. 2, p. 403.

composed of sepiolite. A very typical example which was found to be abundant in one place in the iron ores of the Cerro Mercado, Durango, Mexico, by Dr. W. F. Foshag has recently been analyzed by him in the museum laboratory. The results of this analysis are given together with two other sepiolites of similar structure and composition:

Analyses of fibrous sepiolites

	1	2	3		1	2	3
SiO ₂	55.34	52.97	51.84	Na ₂ O.....			.45
Al ₂ O ₃	1.81	.86	1.51	K ₂ O.....			.25
Fe ₂ O ₃.....	.43	.70	None.	H ₂ O above 110° C.....	10.20	9.90	9.63
Mn ₂ O ₃		3.14		H ₂ O below 110° C.....	8.60	8.80	10.55
CaO.....	.24						
CuO.....		.87			99.57	99.74	98.77
MgO.....	22.95	22.50	24.54				

1. Light corky snow-white masses associated with clear yellow apatite crystals in iron ore, Cerro Mercado, Durango, Mexico. Wm. F. Foshag, analyst.
2. Fibrous material "from a silver mine in Utah." A. H. Chester, analyst. Amer. Jour. Sci., vol. 13, p. 296, 1877. Dana System of Mineralogy, 6 ed. p. 681.
3. "Hydrous anthophyllite" Alberton, Md. Geo. P. Merrill, analyst. Cat. U. S. N. M. No. 62778. 'Asbestos and asbestiform minerals. Proc. U. S. Nat. Mus., vol. 18, pp. 281-292, 1895.

These fibrous sepiolites are very similar to the aluminous materials properly designated paligorskites.

The paligorskite associated with the celestite in the Utah specimens at hand is, superficially, very nearly identical with the Mexican material. It forms typical "mountain cork" masses up to several inches in diameter, which are so porous as to float on absolute methyl alcohol of gravity 0.79. Where not soiled or dirty it is snow-white in color and is lusterless, with a dry meager and papery feel. A purified sample was analyzed, giving then results and ratios of columns 1 and 2 of the following table: The analysis is very similar to that of Fersmann on material from the Kadainsk mine, Nertschinsk, Siberia, as given in column 3.

Analyses and ratios of paligorskite

	1	2	3
SiO ₂	52.55	0.872 0.145×6 0.98×6.....	55.57
Al ₂ O ₃	13.64	.134 .134×1 .91×1.....	12.63
Fe ₂ O ₃	Trace.		
FeO.....			.43
CaO.....	1.39	.025} .145×2 .98×2.....	.15
MgO.....	10.63	.264}	9.75
SiO.....	Trace.		
H ₂ O 100° C.....	14.16	} 1.205 .151×8 1.03×8.....	12.34
H ₂ O-110° C.....	7.66		9.10
	100.03		99.97

1. Paligorskite from Utah. Earl V. Shannon, analyst.
2. Ratios of same.
3. Paligorskite, Nertschinsk, Siberia. A. E. Fersmann, analyst.

The above analysis of the Utah material yields rather closely the formula 2MgO.Al₂O₃.6SiO₂.8H₂O. The material from Russia represented by Fersmann's analysis is interpreted by him as composed of

1 part of parasepiolite (A) with 2 parts of paramontmorillonite (B). The isomorphous mixture in these proportions he calls beta-paligor-skite. Under the microscope the Utah material appears in matted aggregated of fine fibers which have a more or less parallel position. The material is not suitable for exact optical measurements. The masses show moderate birefringence, parallel extinction, and positive elongation. The mean index of refraction is about 1.490. The masses of fibers show a confused interference figure with the emergence of a negative bisectrix, apparently of large angle and possibly the obtuse bisectrix. This would make the mineral optically positive with Z the elongation. These are similar to the properties given by Larsen for parasepiolite which, however, is optically negative.

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NEW FOSSIL MOLLUSKS FROM THE MIOCENE OF VIRGINIA AND NORTH CAROLINA, WITH A BRIEF OUTLINE OF THE DIVISIONS OF THE CHESAPEAKE GROUP

By WENDELL C. MANSFIELD
Of the United States Geological Survey

The purpose of this paper is to briefly outline the different divisions of the Chesapeake group of the Miocene epoch in Virginia and to describe and illustrate seven new species and five new subspecies of mollusks occurring in some part of this group.

I wish to express my sincere thanks to the officials of the United States National Museum for the facilities offered by this institution in the use of former collections. The types of the described mollusks are deposited in the United States National Museum.

DIVISIONS OF THE CHESAPEAKE GROUP

Inasmuch as a more complete discussion of the divisions of the Chesapeake group is to be published under the heading "Summary of the Miocene stratigraphy of Virginia based upon the study of the fauna" in a volume forming a number of the George Washington University Bulletin, it is undesirable to give here more than a brief outline.

The following divisions are recognized:

Chesapeake group	Yorktown formation	{	Zone 2, or <i>Turritella</i> alti-costata zone	{	upper part
					middle part
					lower part
	St. Marys formation	{	Zone 1, or <i>Pecten clintonius</i> zone	{	
			Zone 2, or <i>Crassatellites meridionalis</i> zone		
	Choptank formation	{	Zone 1, or <i>Bulliopsis quadrata</i> zone	{	
	Calvert formation	{	Stratum A	{	

The Calvert formation constitutes the lower part of the Chesapeake group. The material composing this formation consists of dark-gray or olive sandy, usually diatomaceous clay.

The Choptank formation, where recognized, overlies the Calvert. The materials composing this formation consist of dark-brown rather soft sand and greenish-gray clayey sand alternating with indurated sandstone layers.

The St. Marys formation is divided into three parts. The lower part, or stratum A, consists of a nearly unfossiliferous dark sandy plastic clay. The overlying fossiliferous parts are divided into two faunal zones—zone 1, or *Bulliopsis quadrata* zone, constituting the lower fossiliferous part, and zone 2, or *Crassatellites meridionalis*, the overlying part.

The Yorktown formation is separated into two faunal zones—zone 1, or *Pecten clintonius* zone, for the lower part; and zone 2, or *Turritella alticostata*, for the overlying part.

Zone 1 includes, in part, the "Murfreesboro stage" of Olsson.¹ The term Murfreesboro is preoccupied, being used by Safford and Killebrew² to designate the lowest limestone of the Central Basin of Tennessee. As the fauna of this zone is more closely related to the fauna of the Yorktown formation than to that of the St. Marys formation, I have placed the zone as the basal part of the Yorktown.

Zone 2 of the Yorktown formation is again divisible into three minor divisions. The lower part underlies the fragmental beds; the middle part, the fragmental beds; and the upper part overlies the fragmental beds and represents the latest deposit of the Yorktown formation in Virginia.

DESCRIPTIONS OF NEW SPECIES³

Class GASTROPODA

CLATHRODRILLIA? BELLOIDES RUSHMERENSIS, new subspecies

Plate 1, figure 4

Shell small, rather solid, moderately slender, prominently axially and finely spirally sculptured, and consisting of six remaining whorls—nucleus broken away. Whorls expanded medially, constricted at the sutural zone. Suture appressed. Anal fasciole wide, shallowly depressed, undulated anteriorly by the rising ribs. Axial sculpture of (on the body whorl, nine) strong, rounded, protractive

¹ Olsson, Axel, Bull. Amer. Paleontology, vol. 5, pp. 155–163, 1917.

² Safford, J. M., and Killebrew, J. B., Elements of Geology of Tennessee, p. 125, 1900.

³ The photographic illustrations were made in the laboratory of the United States Geological Survey by Mr. W. O. Hazard and the retouching of the prints by Miss Frances Wieser of the section of illustrations of the same bureau.

ribs, extending from the anal fasciole forward to the suture on the spire whorls and to the base on the body whorl. Spiral sculpture of narrow bands on the whorls in front of the anal fasciole; on the early whorls these are narrow, closely set, and occasionally intercalated with a spiral thread; on the later whorls, especially over the base, the bands are wider and usually intercalated with a finer spiral. Spiral sculpture within the anal fasciole of fine closely set threads. One or two slightly heavier threads lie in front of the suture. The spiral sculpture over the whole surface of the shell is minutely roughened by axial growth-lines. Aperture wide, subovate in form. Anal notch wide and deep. Outer lip thin, slightly inflected at the lower part. Columella and parietal wall with a heavy wash of callus. Siphonal canal short, anteriorly bent backward.

Dimensions.—Type (Cat. No. 352436, U.S.N.M.), altitude, 11 mm.; greatest diameter, 4 mm.; length of aperture, 4 mm.; width of aperture, 1.8 mm.

Type locality.—U. S. G. S. Station 1/236, Rushmere Wharf, on James River, Va., highest bed exposed. (W. C. Mansfield, collector.)

The new subspecies differs from *Clathrodrillia? belloides* (Olsson), described from the Yorktown formation, James River above Smithfield, Va., in having fewer, stronger, and more protracted axials.

Occurrence.—Yorktown formation, middle part of the *Turritella alticostata* zone; known only from type locality.

FUSINUS (BUCCINOFUSUS) PROPEPARILIS, new species

Plate 1, figures 5, 9

Shell of moderate size, fusiform, solid, axially and spirally sculptured. Whorls rapidly enlarging, rounded, moderately constricted at the suture. Suture appressed and undulating. Subsutural area wide and shallowly excavated. Axial sculpture of (on the penultimate whorl, twelve) strong, rounded, vertical ribs, strongest over the periphery of the whorl. These ribs do not descend to the base on the first half of the body whorl and become obsolete over the last half. Whole surface axially marked by fine growth lines, all the spirals being rugose. Spiral sculpture of five to six primary threads, beginning on the posterior slope and extending forward to the suture. There are about 26 of these spirals on the last whorl and the canal. Besides the primary spirals, secondary threads varying in strength intercalate the primary spirals and ornament the rest of the surface. On approaching the end of the canal these secondaries become stronger and are reduced to two or three in number. Aperture ovate. Canal long and reflexed anteriorly. Columella coated with callus along the border and side of the siphonal canal.

Dimensions.—Type (Cat. No. 370828, U.S.N.M.), altitude, 83 mm.; greatest diameter, 28 mm.

Type locality.—U. S. G. S. station 1/473a, Bellefield, Va., basal bed. (W. C. Mansfield, collector.)

The new species is related to *Fusinus parilis* (Conrad), a species in the St. Marys formation, but Conrad's species is a stouter shell, having a proportionally larger body whorl. The spirals, also, on the St. Marys species are much stronger and the subsutural area is less excavated and more coarsely spirally marked.

Occurrence.—Yorktown formation, zone 1, Grove Wharf (old wharf), James River, Va., lowest bed exposed. (Collected by Dr. Frank Burns, 1892, and by W. C. Mansfield, 1923.)

PISANIA (CELATOCONUS) BURNSI, new species

Plate 1, figures 1, 3

Shell solid, elongate-ovate, body whorl about twice as long as spire, consisting of about five whorls—apical whorls decorticated. Sutural area moderately depressed, suture close-fitting, shallowly and narrowly channeled. Sculpture of (on the body whorl, 23) seminodulose, nearly flat, brown spiral bands separated by areas of about half their width. Over the basal slope of the body whorl a spiral line intercalates the bands. Growth lines overrun the spirals and interspaces and give a faint reticulate ornamentation to the shell. Aperture elongate-ovate. Margin of outer lip partly broken away; within ornamented with about 11 lirae. Parietal wall and columella with a wash of callus. Columella twisted, anteriorly ornamented with a rather strong fold. Siphonal fasciole well developed, provided with an elongated chink in front.

Dimensions.—Type (Cat. No. 352437, U. S. N. M.), altitude, 28 mm.; greatest diameter, 13 mm.; length of aperture, 15 mm.

Type locality.—U. S. G. S. station 3915, river front at Urbanna, Va. (Frank Burns, collector, 1903.)

The new species is related to *Pisania nux* Dall but is a heavier shell, has a less reticulate sculpture ornamentation and a stronger and better developed siphonal fasciole than Dall's species. The new species is named after the collector, Dr. Frank Burns.

Occurrence.—St. Marys formation, zone 2, only known from type locality.

COLUMBELLA (SEMINELLA) SMITHFIELDENSIS, new species

Plate 1, figures 6, 7

Shell small, stout, rather fragile, spirally sculptured, having body whorl longer than spire, consisting of $1\frac{1}{2}$ nuclear and three post-

nuclear whorls. Nuclear whorls large, smooth, moderately inflated, constricted at the suture, apical one bluntly rounded. Post-nuclear whorls rather rapidly enlarging and broadly rounded in outline. Suture grooved, not appressed. Sculpture of (on the penultimate whorl, five) slightly raised, paired, spiral lines, the individual lines composing each pair being separated from each other by a narrow groove and the pairs from each other by an interspace about equal to their width. The spirals extend forward to the end of the canal. Very fine axial growth lines connect the paired spirals. Aperture elongate-subovate, outer lip thin, margin crenulate. Pillar at its lower margin provided with a fold, forming the inner and upper edge of the short and curved siphonal canal. The new species may not be mature.

Dimensions.—Type (Cat. No. 352438, U. S. N. M.), altitude, 3.8 mm.; diameter, 1.6 mm.; length of aperture, 1.5 mm.; width, 0.7 mm.

Type locality.—U. S. G. S. station 1/205, uppermost bed in section along a small stream flowing into Tormentor Creek, about 2 miles north of Smithfield, Va. (W. C. Mansfield, collector.)

Occurrence.—Yorktown formation, zone 2, middle part; only known from type locality.

EPITONIUM SMITHFIELDENSIS, new species

Plate 1, figure 10

Shell of medium size, stout, delicately ornamented with slender varices, consisting of seven remaining whorls—nucleus decollate. Whorls well rounded, gradually and evenly enlarging, and very strongly constricted at the deeply grooved suture. Sculpture of (on the last whorl, 12) wide, very thin, marginally reflected retractive varices, the margins being cuspidate at the posterior third and ends fused to the preceding and succeeding varices. The varices extend diagonally across the whorl and, followed successively up the spire, make about a half-turn around the axis. No other ornamentation is present. Aperture orbicular in shape, outer margin formed by the terminal varix and inner margin by a thin lamina adhering to the varices.

Dimensions.—Type (Cat. No. 352440, U.S.N.M.), altitude, 12 mm.; greatest diameter, 5 mm.; greatest diameter of aperture, 2.2 mm.

Type locality.—U. S. G. S. station 1/205, uppermost bed in a section along small stream flowing into Tormentor Creek about 2 miles north of Smithfield, Va. (W. C. Mansfield, collector.)

Occurrence.—Yorktown formation, zone 2, middle part. Only known from the type locality.

FOSSARUS (ISAPIS) URBANNAËNSIS, new species

Plate 1, figures 2, 8

Shell large, turbinate, tabulated at the shoulder, spire high for genus, consisting of about three whorls, early whorls decorticated. Suture deep and grooved. Spiral sculpture on body whorl consists of a faint line on the posterior slope and three strong elevated, equally-spaced ridges on the periphery, the posterior two being weaker and slightly marginally reflected, the anterior one stronger, nearly flat-topped, and coronated. Base with three spirals, anterior two stronger; anterior one surrounds the umbilicus. Fine granulose spirals override the strong ridges and the irregular transverse growth lines. Aperture nearly round, axial diameter a little greater. Outer margin of aperture undulating in conformity to spiral sculpture, inner margin slightly reflected over the umbilicus.

Dimensions.—Type (Cat. No. 352439, U.S.N.M.), altitude, 7 mm.; diameter, above the aperture, 5.2 mm.; axial diameter of aperture, 3.5 mm.

Type locality.—U. S. G. S. station 3915, river front at Urbanna, Va. (Frank Burns, collector, 1903.)

Fossarus dalli Whitfield is related to the new species but lacks the fine granulose spirals, has a less angled basal slope, and stronger transverse sculpture crossing the strong spirals.

Occurrence.—St. Marys formation, zone 2. Known only from type locality.

Class PELECYPODA

PECTEN EBOREUS URBANNAËNSIS, new subspecies

Plate 2, figure 2; plate 3, figure 2

The type locality of *Pecten eboreus* Conrad ⁴ is Suffolk, Va. Dall ⁵ classified different mutations of the species and designated each by a varietal name. The form occurring at Suffolk he designated *Pecten eboreus eboreus*.

The new subspecies differs from the Suffolk form as follows: The ribs are lower and are separated by a shallower and less distinct interspace. Two to three fine radials lie within these interspaces. The ears are larger, the byssal notch deeper, and the radials on the ears are finer and less distinct. The new subspecies is an intermediate form between *P. madisonius* Say and *P. eboreus eboreus* Conrad.

Dimensions.—Cotypes (Cat. No. 370829, U.S.N.M.), right valve, latitude, 107 mm.; altitude, 97 mm.; diameter, 17 mm. Left valve of

⁴ Conrad, T. A., Amer. Journ. Sci., ser. 1, vol. 23, p. 341, 1833.

⁵ Dall, W. H., Wagner Free Inst. Sci. Trans., vol. 3, pt. 4, p. 750, 1898.

another specimen, latitude, 104 mm.; altitude, 98 mm., diameter, 20 mm.

Occurrence.—St. Marys formation, zone 2. U. S. G. S. station 3915, Urbanna, Va. (type locality); U. S. G. S. station 1/476a, Lanexa, Va., lower bed; U. S. G. S. station 1/233, Scotland Wharf, Va., right bank of James River, bed 10 to 16 feet above beach; U. S. G. S. station 1/540, Schmidts Bluff, right bank of James River, Va., lowest bed; Mount Folly, right bank of York River, Va.

THRACIA (CYATHODONTA) DALLI, new species

Plate 4, figures 1, 2

Shell of medium size, thin, translucent, inequilateral—anterior side being longer, right valve larger than left and more inflated. Right valve rounded on anterior side and over the middle of disk and slightly depressed in front of the posterior ridge; left valve slightly depressed medially. Posterior dorsal slope on each valve gradually descending, medially depressed, bordered above by a low ridge extending from the beak to the lower posterior angle, and below by a lower ridge. Posterior dorsal margin nearly straight and oblique; posterior margin truncate; anterior dorsal and basal margins evenly rounded. Sculptured externally by coarse concentric rounded ridges, which are nearly obsolete over the posterior dorsal slope; radially sculptured by faint granulose threads, which are more closely set and more prominent over the posterior dorsal slope. Internally, the external concentric sculpture is reflected. Hinge strongly developed for the genus.

Dimensions.—Type (Cat. No. 352442, U.S.N.M.), right valve, latitude, 34 mm.; altitude, 25 mm.; diameter, 9 mm.; left valve, latitude, 33 mm.; altitude (margin broken away), 22 mm.; diameter, 5 mm.

Type locality.—U. S. G. S. station 1/202, about one-fourth mile northeast of Benns Church, Isle of Wight County, Va. (W. C. Mansfield, collector.)

The new species is related to *Thracia* (*Cyathodonta*) *semirugosa* Reeve, which species has been reported by Dall^o as occurring in the Pliocene marl of the Caloosahatchee River, Fla., and living in the Caribbean Sea. Reeve's species possesses a less oblique posterior dorsal margin and is much less inflated anteriorly than the new species here described.

The species is named in honor of Dr. W. H. Dall.

Occurrence.—Yorktown formation, zone 2, middle part.

^o Dall, W. H., Wagner Free Inst. Sci. Trans., vol. 3, pt. 6, p. 1526, 1903.

PANDORA (CLIDIOPHORA) CONRADI, new species

Plate 5, figures 4, 5

The specimen consists of attached valves, which have been slightly compressed by the impact of incumbent sediments.

Shell of medium size, subovate in form, thin, inequivalve, and inequilateral, having a strong posteriorly protruding marginal rostrum. Anterior side proportionally rather long for the genus. Anterior margin evenly and narrowly rounded; basal margin broadly rounded. Escutcheon extending nearly to the posterior extremity of valves. Sculpture of fine, close, concentric lines and a few faint diverging radials.

Dimensions.—Type (Cat. No. 352441, U.S.N.M.), greatest latitude, 35 mm.; altitude, 16 mm.; diameter, 4 mm.

Type locality.—U. S. G. S. station 1/221, near the bottom of a small ravine entering Blackwater River and about a quarter of a mile from it and about 1½ miles northwest of Walters, Va.

The new species here described differs from *P. crassidens* Conrad in possessing a proportionally longer anterior side and a much stronger and more protruding rostrum.

Occurrence.—Yorktown formation, zone 2. Known only from the type locality.

CRASSATELLITES (CRASSATELLITES) MERIDIONALIS SURRYENSIS, new subspecies

Plate 5, figures 3, 6

Shell large, solid, ovate, and nearly equilateral, the posterior side being somewhat longer. Outline of anterior, ventral, and posterior margins rounded, the anterior margin slightly more broadly rounded than the posterior. Posterior-dorsal angle obtuse, not ridged, in front of which the disk is weakly constricted. A weak radial is halfway between the shoulder and the border of the escutcheon. Lunule and escutcheon prominent and impressed, the escutcheon a little longer, wider, and more curved than the lunule. Nepionic shell slightly flattened and marked by about 10 moderately strong concentric undulations continued on a radius of about 10 millimeters. The rest of the surface is nearly smooth. The hinge is normal.

Dimensions.—Type—left valve (Cat. No. 370832, U.S.N.M.), latitude, 93 mm.; altitude, 70 mm.; diameter (1 valve), 18 mm.

Dall⁷ placed *meridionalis* as a variety of *Crassatellites melinus* (Conrad). I have raised his variety to specific rank. The new subspecies is a higher and more equilateral shell than the species

⁷ Dall, W. H., Wagner Free Inst. Sci. Trans., vol. 3, pt. 6, p. 1473, pl. 37, figs. 6, 13, 1903.

meridionalis; the posterior extremity is less pinched and the nepionic shell has coarser and shorter radially extending undulations.

Type locality.—U. S. G. S. station 1/241, right bank of James River 1½ miles below Claremont Wharf, Va., from lowest bed.

Occurrence.—St. Marys formation, zone 2, type locality, and at the following localities: U. S. G. S. station, 1/543, about 1 mile below type locality, from lowest bed; U. S. G. S. station 1/241, right bank of James River, Cobham Bay, bed outcropping at water level.

CRASSATELLITES (CRASSATELLITES) MERIDIONALIS URBANNAËNSIS, new subspecies

Plate 4, figures 3, 4

Shell large, moderately thin, low, subovate and inequilateral, the posterior side being longer and more attenuated. Outline of anterior margin narrowly rounded, ventral margin broadly rounded, and posterior margin short and narrowly rounded. Dorsal-posterior shoulder angle obtuse. Disk slightly depressed in front of the shoulder. Nepionic shell slightly flattened and marked by rather closely set undulations continuing radially 7 to 9 millimeters. Surface of disk smooth except for growth lines.

Dimensions.—Type—right valve (Cat. No. 370831, U.S.N.M.), latitude, 100 mm.; altitude, 69 mm.; diameter, 17 mm.

The new subspecies has a lower and larger shell than *Crassatellites meridionalis*. Its posterior extremity is less truncated and less depressed in front of the dorsal posterior shoulder. The nepionic shell has fewer undulations. This subspecies differs from the new subspecies *surryensis* in having a more inequilateral shell and a shorter radial continuation of nepionic undulations.

Occurrence.—St. Marys formation, zone 2, U. S. G. S. station 3915, Urbanna, Va., type locality; U. S. G. S. station 3924, Jones Point, Rappahannock River, Va.

PHACOIDES (LUCINOMA) CONTRACTUS MURFREESBOROËNSIS, new subspecies

Plate 5, figures 1, 2

Shell suborbicular, convex, fragile, equivalve, and nearly equilateral. Beaks low, apices proximate. Posterior dorsal margin straight and oblique, anterior dorsal margin slightly depressed; posterior, anterior, and basal margins well rounded. Sculpture of rather closely set, nearly erect, slightly beakward reflected, concentric primary lamellae, intercalated with about two weak secondary threads.

Dimensions.—Type (Cat. No. 352443, U.S.N.M.), latitude, 28 mm.; altitude, 27 mm.; diameter of both valves, 15 mm.

Type locality.—U. S. G. S. station 1/222, right bank of Meherrin River at Murfreesboro, N. C., basal bed exposed at water level and a little above. (W. C. Mansfield, collector.)

The new subspecies differs from the species mainly in having much closer and stronger concentric primary lamellæ and fewer secondary intermediate spiral threads. Is also much smaller. The dimensions are proportionally the same.

Occurrence.—Yorktown formation, zone 1. Known only from type locality.

EXPLANATION OF PLATES

PLATE 1

- FIGS. 1, 3. *Pisania (Celatoconus) burnsi*, new species ($\times 2$); type; alt. 28 mm.; page 4.
- 2, 8. *Fossarus (Isapis) urbannaënsis*, new species ($\times 8$); type; alt. 7 mm.; page 6.
4. *Clathrodrillia? belloides rushmerensis*, new subspecies ($\times 8$); type; alt. 11 mm.; page 2.
- 5, 9. *Fusinus (Buccinofusus) propeparilis*, new species. Fig. 5 ($\times 3$), fragment of the early whorls of a specimen collected by Frank Burns at Grove Wharf, lower bed, left bank of James River (Cat. No. 146148, U.S.N.M.); Fig. 9, type ($\times 1\frac{1}{2}$); alt. 83 mm.; page 3.
- 6, 7. *Columbella (Seminella) smithfieldensis*, new species ($\times 8$); type; alt. 3.8 mm.; page 4.
10. *Epitonium smithfieldensis*, new species ($\times 3$); type; alt. 12 mm.; page 5.

PLATE 2

- FIG. 1. *Pecten madisonius* Say, variety (natural size): Left valve of another show the form occurring in the same bed with *Pecten eboreus urbannaënsis*. Collected from zone 2, St. Marys formation, at Grays Creek, Surry County, Va. (Cat. No. 370830, U.S.N.M.)
2. *Pecten eboreus urbannaënsis*, new subspecies (natural size): Right valve of cotype; latitude 107 mm.; page 6.

PLATE 3

- FIG. 1. *Pecten madisonius* Say, variety (natural size): Left valve of another specimen from the same locality as specimen, fig. 1, plate 2.
2. *Pecten eboreus urbannaënsis*, new subspecies (natural size): Left valve of cotype; latitude 104 mm.; page 6.

PLATE 4

- FIGS. 1, 2. *Thracia (Cyathodonta) dalli*, new species ($\times 1\frac{1}{2}$); type. Fig. 1, left valve; latitude 33 mm.; Fig. 2, right valve; latitude 34 mm.; page 7.
- 3, 4. *Crassatellites (Crassatellites) meridionalis urbannaënsis*, new subspecies; type. Fig. 3, right valve, natural size; latitude 100 mm.; Fig. 4, beak of same specimen ($\times 5$); page 9.

PLATE 5

FIGS. 1, 2. *Phacoides* (*Lucinoma*) *contractus murfreesboroënsis*, new subspecies.

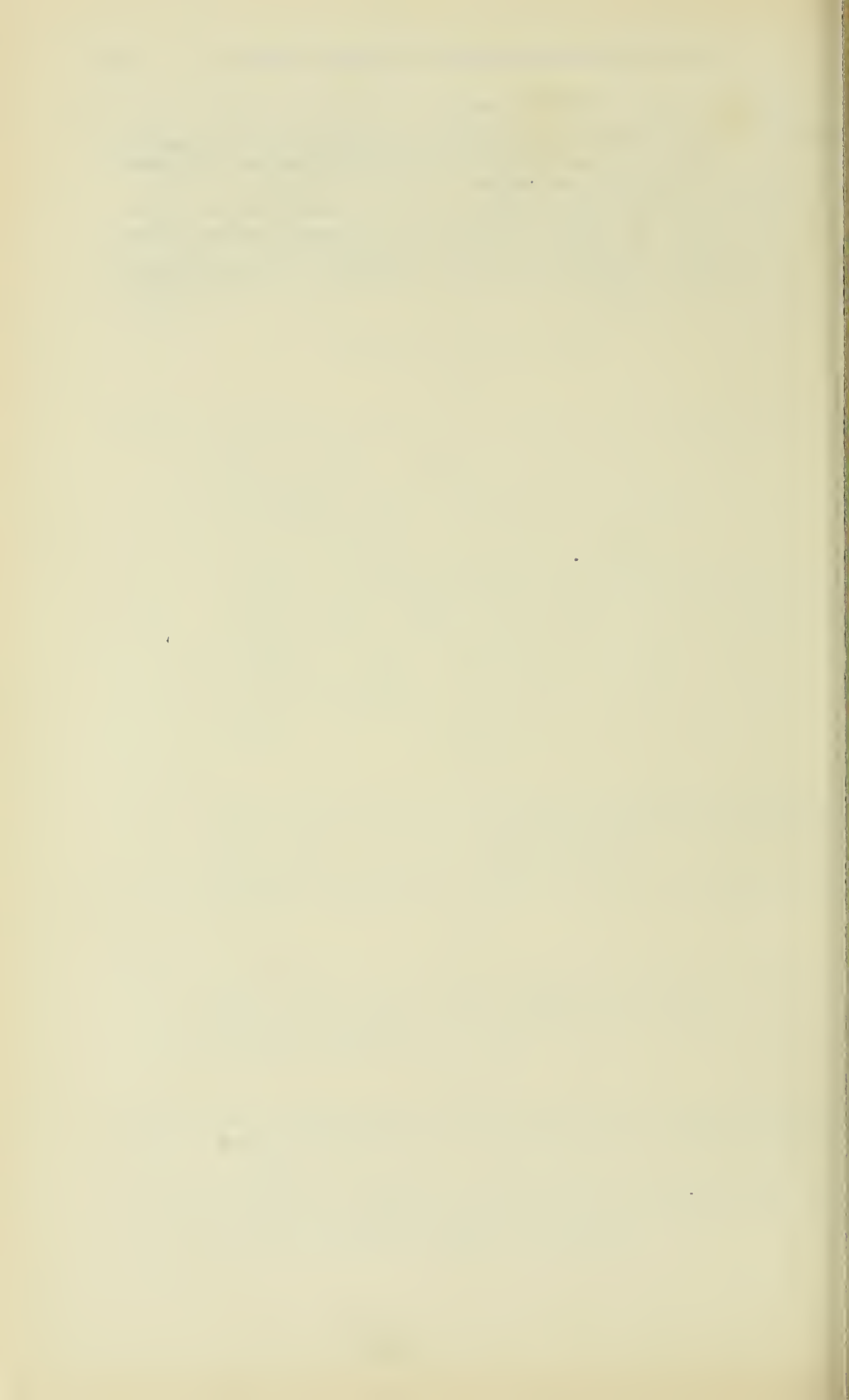
Fig. 1, right valve of type ($\times 3$); latitude 28 mm.; Fig. 2, left valve of topotype ($\times 2$); page 9.

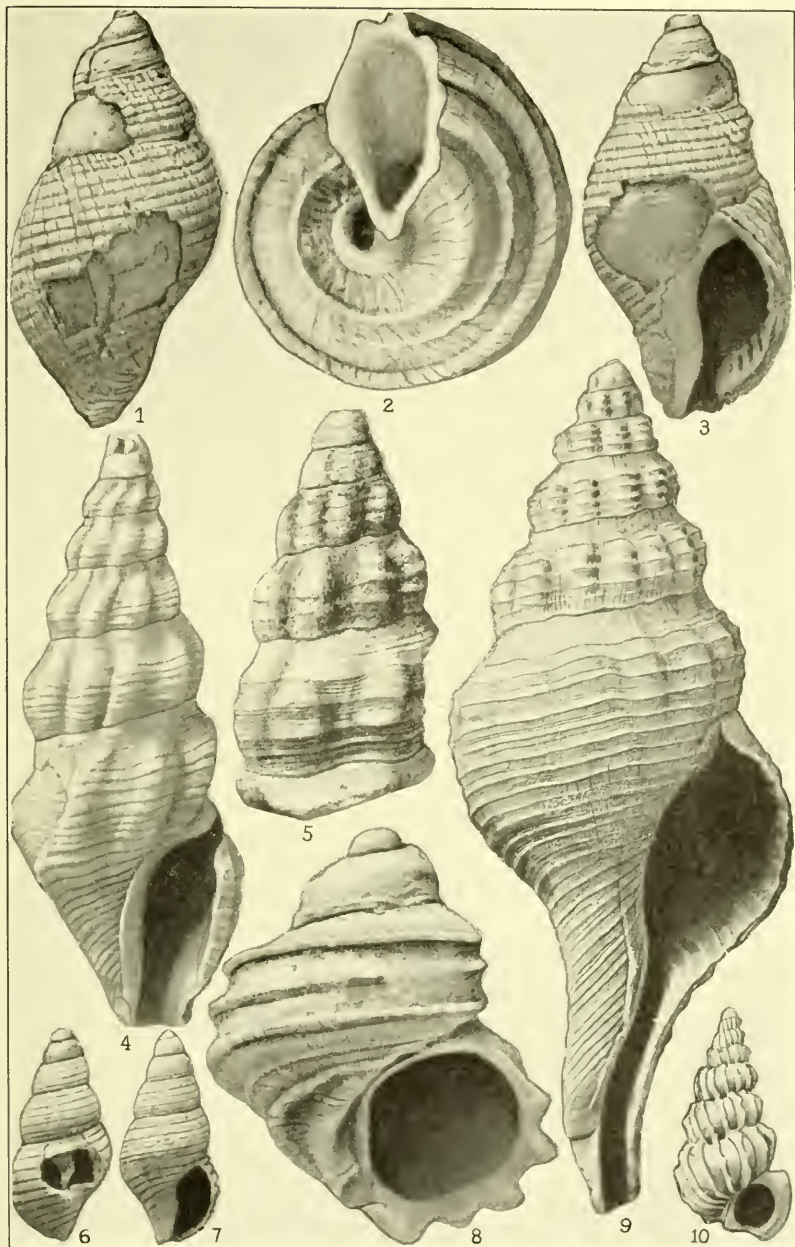
3, 6. *Crassatellites* (*Crassatellites*) *meridionalis surryensis*, new subspecies; type. Fig. 6, left valve (natural size); latitude 93 mm.

Fig. 3, beak of same specimen ($\times 5$); page 8.

4, 5. *Pandora* (*Clidiophora*) *eonradi*, new species ($\times 1\frac{1}{2}$); type; latitude 35 mm.; page 8.

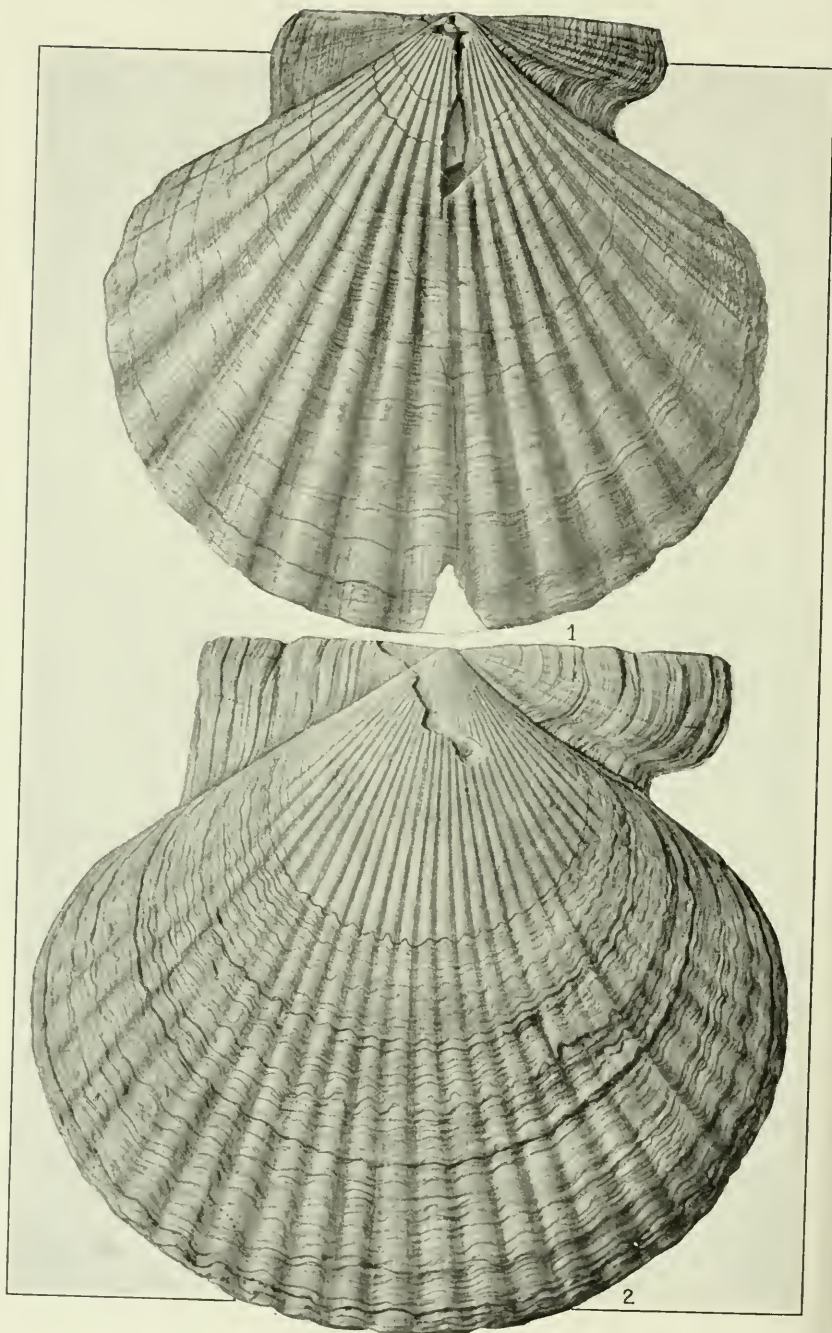






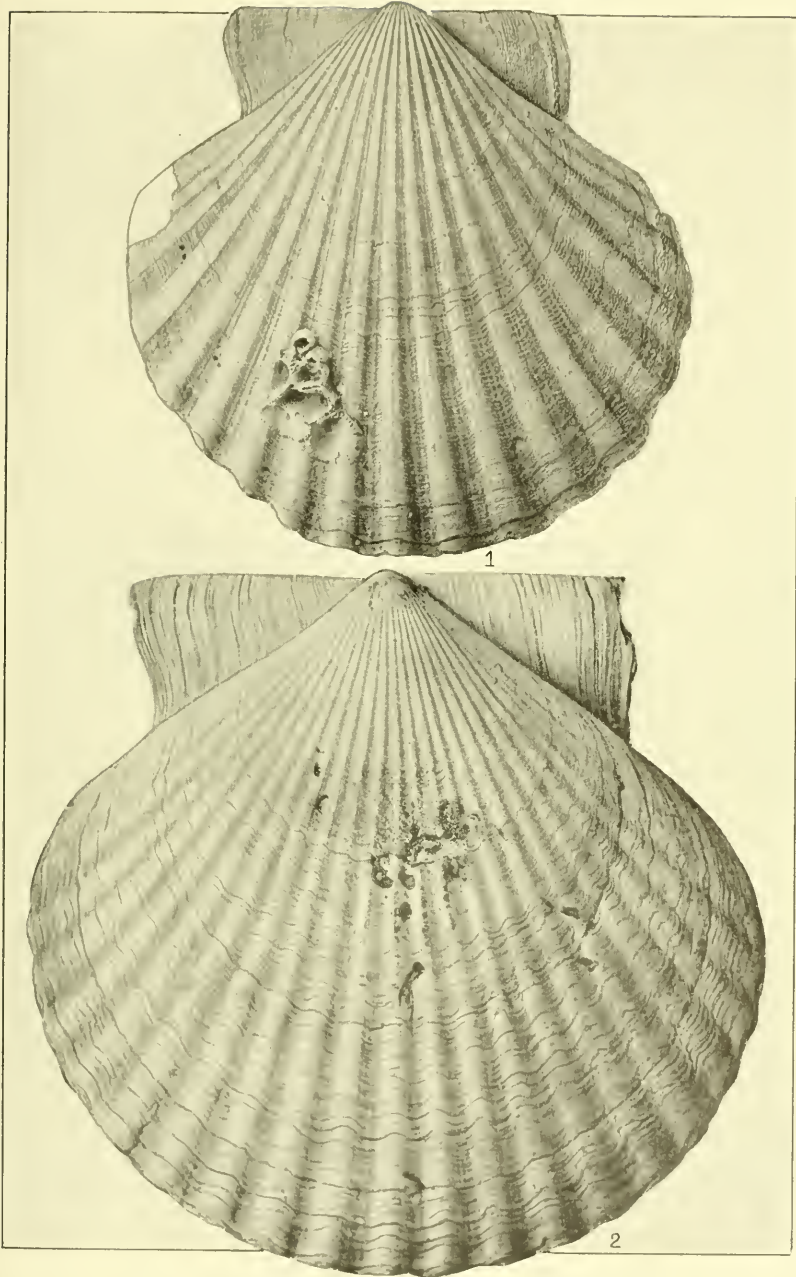
NEW FOSSIL MOLLUSKS FROM THE CHESAPEAKE GROUP

FOR EXPLANATION OF PLATE SEE PAGE 10



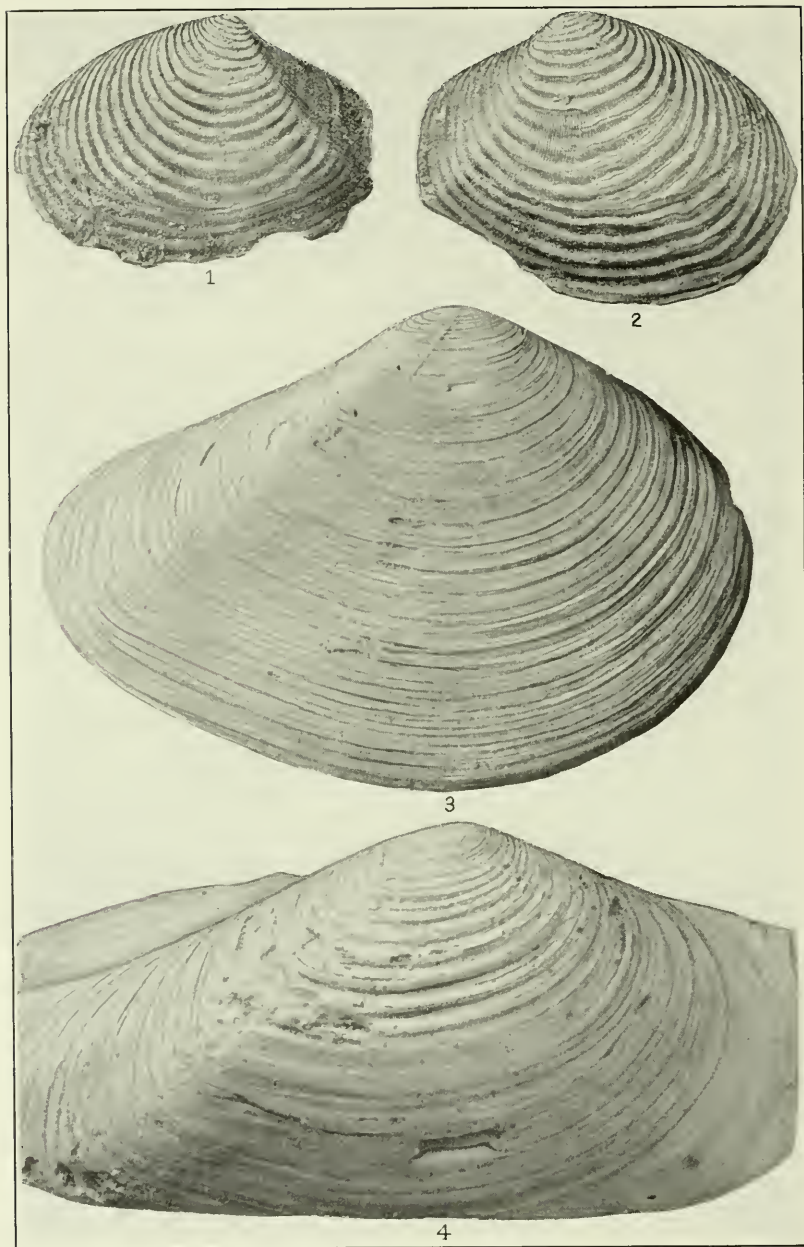
NEW FOSSIL MOLLUSKS FROM THE CHESAPEAKE GROUP

FOR EXPLANATION OF PLATE SEE PAGE 10



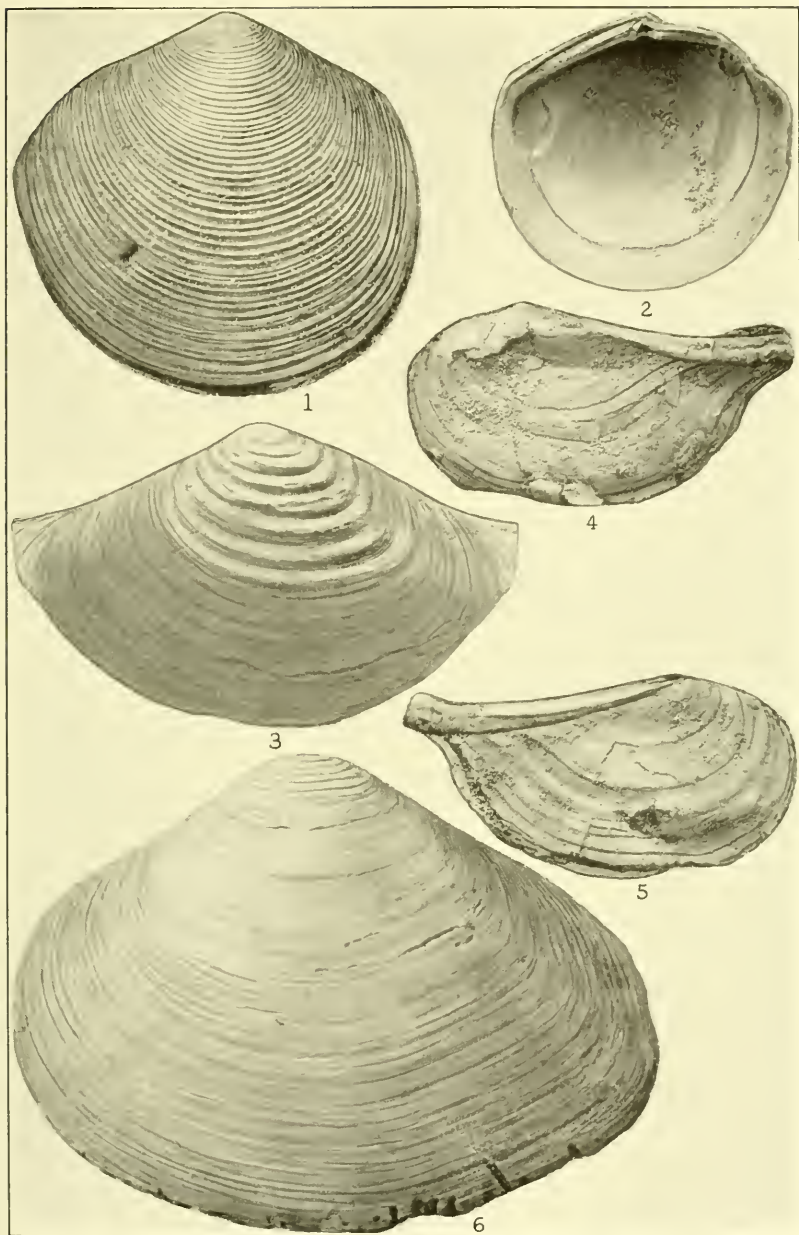
NEW FOSSIL MOLLUSKS FROM THE CHESAPEAKE GROUP

FOR EXPLANATION OF PLATE SEE PAGE 10



NEW FOSSIL MOLLUSKS FROM THE CHESAPEAKE GROUP

FOR EXPLANATION OF PLATE SEE PAGE 10



NEW FOSSIL MOLLUSKS FROM THE CHESAPEAKE GROUP

FOR EXPLANATION OF PLATE SEE PAGE 11



THE FOSSIL CRINOID GENUS VASOCRINUS LYON

By EDWIN KIRK

Of the United States Geological Survey

The present paper is not in the nature of another revision of the genus *Vasocrinus* Lyon, but rather the purpose is to reestablish the genus on the foundations originally laid by its author. In doing this, to be sure, it will be necessary to revise Lyon's somewhat crude and incorrect descriptions in important details. Through the kindness of the late Dr. Frank Springer, in whose collection in the United States National Museum Lyon's original types now are, I have had opportunity to study all of Lyon's material, together with other specimens referable to the genus. As first examined Lyon's types were found with the cup plates outlined in ink, presumably for the guidance of the draftsman. As marked the plates conformed to Lyon's descriptions. A casual inspection of the specimens, however, showed that as regards the plates of the posterior interradius Lyon had erred in his interpretation of the cup structure. The same material is here refigured and the true structures shown and described. In addition information has been obtained in regard to the structure of the tegmen. It is now found that *Vasocrinus* as based on Lyon's own species is a quite different crinoid from what has generally been supposed.

In considering the status of the genus *Vasocrinus* all references subsequent to 1879 may be ignored. In their "Revision"¹ (pp. 94-96 (319-321)) Wachsmuth and Springer chose *Cyathocrinus lyoni* Hall, which is a synonym of *Cyathocrinus hexadactylus* Lyon and Casseday, as type of the genus. They say (p. 95): "In reconstructing the genus we prefer to make *Vasocrinus Lyoni* (*Cyathocrinus Lyoni* Hall), from Crawfordville, the type, because it is found more perfectly preserved in the arm portion; but we scarcely doubt, to judge from the brachials, as far as they are preserved, that the arms in the Devonian species were constructed in a like manner." This generic conception of *Vasocrinus* as modified by Wachsmuth and Springer has

¹ Wachsmuth, Charles, and Springer, Frank, Revision of the Palaeocrinoidea, Part 1, Acad. Nat. Sci. Philadelphia Proc. for 1879, pp. 226-378 (author's separate pp. 1-153), pls. 15-17.

been the one accepted by subsequent authors. In no case has Lyon's original material been studied except by Wachsmuth and Springer. The genus then as defined and discussed by various authors has been the *Vasocrinus* of Wachsmuth and Springer and not the *Vasocrinus* of Lyon. *Cyathocrinus hexadactylus* Lyon and Casseday (*Cyathocrinus lyoni* Hall), which was chosen by Wachsmuth and Springer as genotype of *Vasocrinus*, can not be retained. Such a procedure exceeds the somewhat elastic bounds permitted subsequent authors in designating a genolectotype. *Vasocrinus* was founded by Lyon to take care of the two Devonian species *valens* and *sculptus* and the transfer of the genus to a Carboniferous species which by no chance is congeneric with either of the original species is scarcely admissible. In rejecting *Vasocrinus* as represented by the structures found in *Cyathocrinus hexadactylus* Lyon and Casseday I am forced back to a consideration of Lyon's original species. For the reception of *Cyathocrinus hexadactylus* Lyon and Casseday (*Cyathocrinus lyoni* Hall) it is necessary to create a new genus, for which the name *Pellecrinus* is here proposed.

In 1857 Sidney S. Lyon² described and figured the new genus *Vasocrinus*, referring to it two new species, *V. valens* and *V. sculptus*. This report is now somewhat difficult to obtain. The plates illustrating the paleontologic part of the report were distributed in a separate atlas with cardboard covers. This atlas is even rarer than the report. As the plates of the atlas are not bound in, sets are seldom complete. For these reasons it has seemed best to republish Lyon's original descriptions in full and to reproduce the original figures as well. As Lyon's figures will frequently be referred to and the individual specimens designated by the numbers appearing on Lyon's plate the figures as here shown on Plate 1, Figure 10, are given the same numbers and letters used by Lyon. In his descriptions Lyon used three specimens. It is essential that the identity of each of these be kept in mind, for as will be shown one of these specimens (3b) seems to have been referred originally to *V. valens* by Lyon and used in the description of that species by him, although subsequently identified as *V. sculptus*. A transcription of Lyon's text and his explanations of the *Vasocrinus* figures on the plate are here given.

[TEXT, PAGES 485-487]

Genus VASOCRINUS Lyon

Gen. char.—Body vase shaped; twice as wide as high; basal pieces five; pentagonal; pointed at their superior margin; primary radials five; rising between the points of the basal pieces; secondary radials five; broad; irregu-

² Lyon, S. S., in Owen, D. D., Third Report of the Geological Survey in Kentucky, pp. 485-487, pl. 4, figs. 3, 3a-d, 1857.

larly pentagonal; arms five; single; composed of cylindrical pieces; anal piece one; hexagonal; large; summit unknown; column unknown.

VASOCRINUS VALENS Lyon

(Plate IV, Figures 3, 3a)

Basal pieces, five; low, broad; pointed at their summit; swelling at the base; forming a shallow cup, with perpendicular sides; bottom slightly concave; superior margin divided by obtuse points into five broad, shallow, angular notches; the base articulates with the column by a surface marked by striae, radiating from a small circular opening.

Radial pieces, five; smooth; subhexagonal; differing slightly in size; higher than wide; rising between the basal pieces.

Secondary radials, five in number; smooth; pentagonal; nearly twice as wide as high; the median line of these pieces are nearly horizontal; the truncated face, for the insertion of the arms, elliptical, concave, perforated near the center, deeply sulcate above the perforation; the sides are joined together, curving upward and terminating on the summit between the arms; the piece on the left of the anal piece is much larger than either of the others, and covers the points of two of the radials, whilst that on the right of it is smaller than the others and rises from the point and left side of the primary radial, beneath it. The anal piece is large, subhexagonal, rising between two of the primary radials, and extends above the lower margin of the axillary face of the second primary radials.

Arms composed of cylindrical pieces, their length and diameter being nearly equal; perforated and deeply sulcate on the superior side.

Dimensions:

Diameter of the base-----	0.45 inch.
Height of the base-----	0.27 inch.
Height of the body-----	0.55 inch.
Greatest diameter-----	1.05 inches.
Diameter of the axillary articulation-----	0.27 inch.

Remarks.—This remarkable crinoid was obtained several years since at the quarries on Beargrass Creek, near Louisville, where it was found associated with *Actinocrinus*, *Dolatocrinus*, etc. It is very rare—this specimen is the only one of this species heretofore obtained.

VASOCRINUS SCULPTUS Lyon

(Plate IV, Figures 3b, 3c, 3d, 3e)

Body small; vase shaped; section at the junction of the arms pentagonal; side of pentagon above the anal pieces nearly twice as long as either of the others; the surface is roughened by raised sculpture; the center of the pieces below the arms are all prominent. On either side of the sutures marking the junction of the basal pieces is a raised rib, which terminates at the center of the first radial pieces lying above the sutures. Similar ribs cover the body, extending from near the center of each to the center of all the contiguous pieces (except the basal pieces), thus dividing the surface into nearly equal-sided triangular spaces, deeply depressed at the center, and curving up to the ribs which define them; at the end of the ribs the triangular spaces are joined by a narrow grooved avenue, not quite so deep as the center of the spaces.

Basal pieces five; pentagonal; as high as wide; extending beneath to the columnar perforation; junction with the column slightly concave.

Radial pieces five; hexagonal; four of equal size; as high as wide; one much larger than the others, rising between the points of the basal pieces.

Secondary radials (scapulae, Miller) five; irregularly pentagonal; nearly equal in size, except the piece on the left of the anal pieces, which is nearly twice as large as either of the others; articulating facet of the arms uneven; perforated; sulcated upon the upper side; the pieces curve upward at their line of junction, and terminate upon the summit above the line of the arms.

Anal pieces two; hexagonal; one equaling in size the first radial pieces; the other is quite small.

Arms five; single; structure beyond the first joint unknown; they start from the body in a horizontal direction.

Column unknown.

Geological position and locality.—Found in the limestone about 5 feet beneath the Devonian black slate, and above the beds of Hydraulic cement stone, Jefferson County, and in the same geological position on the falls of the Ohio. It does not appear, from what is known of it, to have a very great vertical range, probably not more than 3 or 4 feet.

[“EXPLANATION OF THE PLATES,” PAGE 497]

Vasocrinus valens Lyon

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FIG. 3. Generic figure, size of nature, the pieces arranged around the columnar facet.

FIG. 3a. Profile view, *Vasocrinus valens*.

FIG. 8b (in error for 3b). *Vasocrinus sculptus*, from which the external sculpture has been removed, anal side front, natural size.

Vasocrinus sculptus Lyon

FIG. 3c. Profile view, natural size, different specimen.

FIG. 3d. Basal view of same specimen.

FIG. 3e. Summit view of same specimen, natural size.

Legend at bottom of Plate IV

FIG. 3. *Vasocrinus*, Generic figure.

FIG. 3a. *Vasocrinus valens*.

FIG. 3b. *V. sculptus* different specimen basal view.

FIG. 3c. *V. sculptus* profile view.

FIG. 3d. View of crown.

FIG. 3e. Basal view.

In regard to specimen 3a Lyon says (p. 486): “It is very rare—this specimen is the only one of this species heretofore obtained.” Lyon’s figure shows this specimen in an inverted position and as viewed probably from the anterior radius. As figured the cup appears to be perfect, and so would one judge from the description. As a matter of fact the specimen is a weathered dorsal cup, well preserved so far as it goes, but lacking two radials and the entire

posterior interradius. There is no reason to believe that the cup was more perfect in Lyon's day than now. The broken margin of the cup is weathered, and nowhere is there a sign of fresh fracture. There can be no question as to the identity of the specimen. It bears a piece of paper with a printed number (in this case 119) such as is found on all of Lyon's specimens. There is also an inked "3a" on the specimen, referring to the figure on his plate, and the plates of the cup are outlined with ink in the same manner as other figured specimens in his collection. It is evident that the fourth and fifth radials shown in the background of his figure were supplied by the draftsman. The description of the posterior interradius and the generic diagram presumably based on this specimen were made from specimen 3b as will be shown hereafter. Although said by Lyon to be the only specimen of the species known, 3a is here made a cotype of the species. Specimen 3b, referred by Lyon to *V. sculptus*, is made a companion cotype. As will be shown specimen 3b was used by Lyon in his description of *valens* and is almost certainly referable to that species.

Specimen 3b as studied by Lyon was partially embedded in a fragment of limestone, concealing the upper part of the posterior interradius. The specimen has been very badly treated. The infra-basals have been broken off and cemented on again. The portion of the cup extending from the l. post. R across the post. IR and around almost to the ant. R. has been deeply gouged by a chisel or similar instrument, until little of the original surface remains. So badly defaced is the specimen that it is difficult to figure it in such a way as to give a correct idea of its original form. I have cleaned the higher part of the post. IR and lifted the entire specimen off the rock. In cleaning the specimen and to avoid mistakes the plate outlines as inked in by Lyon have been washed off. Lyon's number for this specimen was 119, the same as for the type specimen of *V. valens*. It appears that Lyon himself had originally referred this specimen to *valens*. In his explanation of the plate on page 497 this specimen appears under the title *Vasocrinus valens*, although assigned to *V. sculptus*, "from which the external sculpture has been removed." In the legend at the foot of the plate this specimen, although the first referred to *sculptus*, is described as "*V. sculptus*, different specimen basal view." From the crowding of the words and the wording itself I believe that Lyon had first referred this specimen to *valens* and had changed his mind after the plate had been engraved, erasing and changing the specific name from *valens* to *sculptus*. Even more striking proof is afforded by the figure itself and the specimen as originally marked. In the description both of *valens* and of the genus, as well as in the generic diagram, the posterior interradius agrees with Figure 3b and with the specimen

itself as originally marked in ink. The obviously artificial structures shown and described could scarcely have been independently invented and must have been based on the assumed plate arrangement in specimen 3*b*. Again Lyon had catalogued his collection, assigning a separate serial number to each species. These numbers were printed and the bits of paper glued to the specimens. Here we find as noted above that the same number (119) was affixed to both specimens 3*a* and 3*b*. In Lyon's manuscript catalogue this number is identified as *Vasocrinus valens*. It appears, then, that the description of *V. valens*, the generic diagnosis, and the generic diagram were composited from specimens 3*a* and 3*b*, although the latter was subsequently referred to the other species *V. sculptus*. In the present paper specimen 3*b* is referred to *Vasocrinus valens* and made a co-type, despite Lyon's treatment, inasmuch as an essential part of his specific description is based on the specimen.

Specimen 3*c*, *d*, *e* is in a good state of preservation although somewhat weathered. The tegmen is not preserved, but all the plates of the cup show clearly. Here again Lyon's plate outlines have been erased in order to mark them in properly. The specimen bears the printed serial number 120. This specimen is here considered as the holotype of *Vasocrinus sculptus* Lyon.

We have seen that Lyon described two new species under his new genus *Vasocrinus*, basing his descriptions on three specimens, here identified by the numbers originally used by Lyon on his Plate 3*a*, 3*b*, and 3*c-e*, respectively. It now remains to determine the mutual interrelationships of the three specimens and choose a genotype for *Vasocrinus*. Lyon himself evidently based his generic description on *V. valens*. The generic diagnosis agrees best with the specific description of *Vasocrinus valens*, and Lyon himself (p. 485) cites the generic diagram as *V. valens*. The description of *V. valens*, however, was not made wholly from specimen 3*a*, in spite of Lyon's declaration elsewhere quoted that this was the unique specimen of the species. As noted above, this specimen is an imperfect dorsal cup, lacking the entire posterior interradius. Furthermore, no arm ossicles are shown in Figure 3*a* nor are any attached to the specimen itself. Nevertheless, arm ossicles are described in the text. Lyon's generic diagram, Figure 3, is obviously based primarily on specimen 3*a*, as shown by the size of the plates. As specimen 3*a* lacks two radials and the posterior interradius, it is evident that the missing plates were obtained elsewhere. Such liberties are not unknown in the case of authors of later generations, unfortunately. The source of supply for these plates could only have been specimen Figure 3*b*. It will be noted that Lyon described his genus as having but one anal plate, though in his specific description of *V. sculptus* he notes the presence of two

such plates. If one will attempt to reconstruct a dorsal cup from generic diagram Figure 3 he will find that an impossible crinoid structure results. Precisely such a structure is indicated in Figure 3*b*, and as I first saw it the specimen itself had the same curious grouping of malformed plates outlined on the surface in ink. What Lyon actually did was to coalesce l. post. R with part of anal x. His large single anal plate and its remarkable shape was brought about by the coalescence of R A with part of anal x, part of r. post. R, part of post. B, and all of r t.

Were specimen 3*a* the only individual referable to *Vasocrinus valens*, I would reject the species as genotype, despite the fact that it is the first species described and evidently was Lyon's own choice. Lacking as it does the essential posterior interradius, the status of the genus would forever be in doubt. To choose *V. sculptus* would be unwise. *V. sculptus* shows structural features sufficiently at variance with those of *valens* to raise a suspicion that when well preserved crowns are available for study the two species might not prove congeneric. Fortunately the matter is simplified by the discovery that specimen 3*b*, used by Lyon in his diagnosis of the genus and in the description of *V. valens*, can well be referred to that species. It can not by any chance be conspecific with specimen 3*c-e*. On the other hand, close comparisons of specimen 3*b* after being freed from the matrix with specimen 3*a* as well as other imperfect specimens clearly conspecific with 3*a*, but of smaller size, indicate the propriety or rather necessity of referring specimen 3*b* to *Vasocrinus valens*. Furthermore, a well-preserved theca, clearly congeneric with *valens*, has come to light that not only shows all the plates of the dorsal cup, but has a well-preserved tegmen. With specimens 3*a* and 3*b* united under one species, most of our troubles are over. Now, the generic description of *Vasocrinus* and the description of *V. valens* are in complete harmony with the structures of the specimens referred to it—that is, the structure as interpreted by Lyon. The proper course, then, seems clearly to be to make *Vasocrinus valens* the genotype, transferring to the species specimen 3*b*.

Genus VASOCRINUS Lyon

In drawing up the formal definition of the genus *Vasocrinus* the type species *V. valens* Lyon and the closely allied *V. turbinatus*, new species, have been used. *V. sculptus* Lyon may be congeneric and so far as its structures are known can not well be separated from the genus. Its variations in structure from the typical forms have not, however, been incorporated in the generic description. Two new species from the Middle Devonian, one from the Hamilton of New York and the other from the Traverse formation of Michigan, are

tentatively referred to *Vasocrinus*, but their ascription to the genus is not sufficiently certain to warrant their description in this paper.

Jaekel³ has proposed the new genus *Costalocrinus* with *Poteriocrinus dilatatus* L. Schultze as the genotype. *Costalocrinus dilatatus* does not have rt in the dorsal cup, but otherwise greatly resembles *Vasocrinus*. Among the described crinoids of the German Devonian, two species I think are certainly referable to *Vasocrinus*. These are *Posteriocrinus stellaris* L. Schultze and *Parisocrinus canaliculatus* Jaekel. It is of interest to note in this connection that the type of *Vasocrinus stellaris* (Schultze) has no rt, but a specimen considered by Jaekel as undoubtedly conspecific has three anal plates in the cup. *Vasocrinus canaliculatus* (Jaekel) appears to be very close to the typical form of *Vasocrinus*.

Generic diagnosis.—Dorsal cup subturbinate to somewhat bowl-shaped. Plates relatively thin. Radials curving inward in their upper portions, forming a marginal platform around the periphery of the tegmen, except in the posterior interradius. Arm facets broadly horseshoe shaped, with the axial canal typically separate from the food groove. There is a tendency toward the suppression of the food groove in the anterior radius. Arms stout in their proximal portion, horizontally disposed or somewhat inclined upward. Judging by the articular facets, the arms were capable of considerable movement upward. Three anal plates within the cup, RA, x, and rt, supporting a stout ventral sac. The tegmen is low, composed in the main of small plates, and a madreporite is probably present. The stem is round and pierced by a pentagonal or pentalobate canal. The ornamentation of the cup consists of series of folds radiating from the centers of the plates.

Horizon.—So far as known, *Vasocrinus* is restricted to the Middle Devonian.

Genotype.—The genotype is *Vasocrinus valens* Lyon.

VASOCRINUS VALENS Lyon

The description of this species is based on the original specimens of Lyon's Figures 3a and 3b, supplemented by three imperfect dorsal cups from the type locality.

Lyon's type specimen, Figure 3a, gives the following measurements:

Height of dorsal cup, 14 mm.

Diameter of dorsal cup, 25 mm. \pm (estimated).

Diameter of stem, 9 mm.

Height of IBB, 3.5 mm.

Height of BB, 7 mm.

Width of BB (average), 9.4 mm.

³ Jaekel, Otto, *Phylogenie und System der Pelmatozoen*. *Paleont. Zeitschr.*, vol. 3, Heft 1, p. 61, 1918.

Height of RR (average), 6 mm.

Breadth of RR (average), 13 mm.

Breadth of arm facet (average), 6.5 mm.

Specimen 3*b* gives the following measurements:

Height of cup, 9 mm.

Diameter of cup (ant. to post. IR), 15.5 mm.

Diameter of stem, 4.6 mm.

Height of IBB, 1.6 mm.

Height of BB, 4.7 mm.

Breadth of BB (average), 6 mm.

Height of RR (average), 4.5 mm.

Breadth of RR (average), 7.3 mm.

Breadth of arm facet (average), 4.3 mm.

It will be seen that the dorsal cup is low, with a breadth considerably in excess of the height. The infrabasals form a sharply defined ring with nearly vertical walls. Above, the sides of the cup diverge gently to about one-half the height of the basals. At this point the sides of the cup flare outward abruptly to give the maximum diameter of the cup at the lower margins of the arm facets. This form of the dorsal cup is characteristic of adult individuals. In the case of two large specimens that show the profile of the cup, other than specimen 3*a* from which the description given above was made, there is a slight variation in the outline as given. In one specimen the cup is relatively lower. The infrabasal ring is less sharply defined, and the abrupt outward flare of the sides of the cup involves the greater part of the basals. In another specimen where the surface contours of the plates are better preserved than in the case of the type the outward flare appears to be somewhat less pronounced when the basals are viewed in profile, owing to the relatively high relief of the plates. As a matter of fact, the shape of the cup is about like that of the type. In specimen 3*b*, which is a much younger specimen, the relative proportions of height to breadth are almost exactly the same. Here, however, instead of the abrupt outward flare of the walls of the cup, the sides diverge more evenly from the top of the infrabasal ring.

The stem, judged by its impression on the infrabasals, was large, round in section, and traversed by a large pentagonal or obscurely pentalobate lumen. A dissociated fragment of column placed by Lyon with his specimens of *Vasocrinus* is pentagonal in section, with rounded angles. The lumen of this fragment, its size, and the character of the striae on the faces of the columnals are all very like the impressions of the proximal columnal as shown on the infrabasals. It may be, therefore, that the column was pentagonal in cross-section.

The infrabasals are subequal in size and together form a well-defined cylindrical ring or collar. The lower outer margins of the infrabasals are somewhat thickened, forming a rounded ridge. The basals are irregularly unequal in size. All except those adjacent to

the posterior interradius are hexagonal in outline. The latter two are heptagonal. The r. post. B supports RA on its upper left shoulder. The post. B supports RA on its upper right shoulder and x on its superior face. On one specimen where the surface is somewhat better preserved than usual there are obscure radiating ridges passing over to the adjacent plates. The centers of the basals are elevated, the surface sloping gently to the upper and lower margins and much more abruptly to the sides. This results in well-defined depressions along the interbasal sutures. Low, broad ridges pass over to the radials, outlining these depressions. The radials vary considerably among themselves in size. The arm facets are large and in the adult specimens are nearly vertical in attitude or are inclined very slightly upward. The amount of inclination varies in different rays. In the young specimen 3b the upward inclination is somewhat more pronounced but not greatly so. The radial is pierced by an axial canal separate from the food-groove. On the surface of the arm facet to either side of the axial canal lies a short horizontally disposed articular facet. The surface of these facets is roughened by short vermicular ridges. The upper portion of the radial curves over and inward, forming a platform of appreciable width. Thus the radials from the exterior appear to be massive plates, whereas when cleared from the matrix they are found to be relatively thin. In the posterior interradius there are three anal plates within the cup. The radianal is fairly large, pentagonal, resting below on the post. and r. post. BB, laterally abutting on r. post. R and x and supporting rt above. Anal x is somewhat larger than RA and supports two tube plates. It abuts laterally on l. post. R, RA, and rt, while below it rests on the post. B. The plates of the posterior interradius are traversed by radiating ridges that are really folds in the plates. These progressively become stronger as the tube proper is approached. Outside the proximal tube plates nothing is known of the structure of the tegmen. Specimen 3b has one arm ossicle lying approximately in place. It is short and heavy and is pierced by an axial canal. On either side of the canal is a short articular facet, similar to those present on the main arm facet.

Horizon and locality.—Lyon cites his type specimen as from the quarries on Beargrass Creek, near Louisville, Ky. This would undoubtedly place the horizon as Onondaga (the Jeffersonville limestone of present local usage) of the Middle Devonian.

VASOCRINUS SCULPTUS Lyon

Of this, the second of Lyon's original species, a fair amount of material is now available for study. There are five dorsal cups in an excellent state of preservation. Three of these have the tegmens partially preserved, one has a fragment of column attached and two

show the two proximal arm ossicles, in one case with the covering plates in place. In addition to the specimens coming from the type locality at Louisville, Ky., there is one specimen from Columbus, Ohio.

Following are measurements made of the type specimen:

- Height of dorsal cup, 7 mm.
- Breadth of dorsal cup (post. IR to ant. R), 12.7 mm.
- Diameter of stem, 4 mm.
- Height of IBB, 2.3 mm.
- Height of BB (average), 3.8 mm.
- Width of BB (average), 4 mm.
- Height of RR (average), 3.8 mm.
- Breadth of RR (average), 6 mm.
- Breadth of arm facet (average), 3 mm.

Another specimen of average size gives the following set of measurements:

- Height of dorsal cup, 9 mm.
- Breadth of dorsal cup (post. IR to ant. R), 16 mm.
- Diameter of stem, 5 mm.
- Height of IBB, 2.5 mm.
- Height of BB (average), 5 mm.
- Width of BB (average), 6 mm.
- Height of RR (average), 4 mm.
- Breadth of RR (average), 8 mm.
- Breadth of arm facet, 3 mm.

The largest specimen seen has a breadth of 18 millimeters and a height of 9.5 millimeters.

Stripped of its surface ornamentation, the dorsal cup is broadly obconical in form, the sides diverging evenly to about the level of the radials and then flaring outward very slightly. With the ornamentation preserved, especially in the case of older individuals, the cup appears more rounded. In most specimens the cup is lower on the anterior side. This gives the theca a lopsided appearance which is very pronounced in the type specimen and is developed to a variable degree in different individuals.

The stem is round and at least in its proximal portion composed of alternate wide and narrow columnals. The lumen appears to be pentagonal in outline, with a slight suggestion of lobation.

The infrabasals are subequal in size. Their lower margins are somewhat produced, forming a lip. Near each lateral margin of an infrabasal is a sharp carina that runs from the lip across to the center of the adjacent basal. The basals are hexagonal in outline, with the exception of the posterior and right posterior, which are heptagonal in outline. The basals vary in size but apparently without a definite plan. The r. post. B supports RA on its upper left shoulder. The post. B supports RA on its upper right shoulder and

x above. In addition to the pair of carinae connecting each basal and the infrajacent IBB, a high, sharp keel passes from the center of each basal to each adjacent plate. The radials vary considerably in size and proportions. The arm facets vary in attitude from vertical to being slightly inclined upward. The axial canal and food groove are confluent, although in cases where the plates are well preserved the axial canal is a narrow, deep channel sharply differentiated from the broader V-shaped groove above. In some cases it appears that the canal is arched over and separated from the groove above. In the anterior radial of one specimen the arm facet is greatly reduced in size, and it may well be that in this case no food groove was present. Below the groove and to either side is a triangular articulating facet with the apex pointing to the center. Below and between these facets is a well-defined triangular fossa, while above them is a pair of shallower fossae. The surfaces of the articulating facets as well as the margin of the arm facet are sharply crenulate. The upper margin of the radial curves inward, forming a platform around the margin of the tegmen. High, sharp keels pass from radial to radial at the lower level of the arm facets. Two similar keels likewise radiate from the arm facet to the infrajacent basals. Two brachials are preserved in one ray of each of two individuals. In the small specimen the brachial is constricted in the median portion, giving it a somewhat hour-glass shape. In the large specimen the brachial is almost cylindrical. In neither case is the second primibrach axillary. In the smaller specimen the arm covering plates are beautifully shown. They consist of a double series of high interlocking plates, there being three pairs to an ossicle.

There are three plates of the anal series incorporated in the cup. RA is unusually large in some specimens, being as large or larger than x. RA is pentagonal in outline and bears the customary relations to the adjacent plates. Plate x supports two tube plates. The plates of the posterior interradius are traversed by series of plications similar to those on the remainder of the cup.

The tegmen is partially preserved in three specimens. It is made up of thin plates that apparently formed a weak structure. The outstanding feature of the tegmen is the presence in each specimen of a large knoblike madreporite. The openings of the canals penetrating the plate may clearly be seen in two of the specimens. In one specimen what appears to be part of the ventral sac is preserved. The sac is inclined upward slightly from the horizontal and curves gradually to the left. It is compressed laterally and increases gradually in size distad. Its point of inception is about on a level with the arm bases and on the right side of the posterior interradius.

Very little of its structure can be made out. It was originally buried in a very hard fine-grained limestone, and great difficulty was had removing the closely adherent matrix.

The highly developed knifelike keels or carinae that form the characteristic ornamentation of the species and the character on which Lyon based his name are very interesting. In the type specimen, which is a fairly young individual, these ridges are worn down and show as slits, proving that at least in their basal portions the carinae are sharp folds in the thin plates. Dissociated plates and interiors also show this fact clearly. The higher portions of the carinae are solid.

Horizon and localities.—Lyon writes that his specimens were collected "about 5 feet beneath the Devonian black slate, and above the beds of Hydraulic cement stone, Jefferson County, and in the same geological position on the falls of the Ohio." This would place the species in the Beechwood limestone member of the Sellersburg limestone (approximately Hamilton). One lot of material bears a recent label of "Falls of the Ohio, Clark Co., Ind." Another silicified specimen with the infrabasals practically worn away but otherwise in an excellent state of preservation was collected by H. Hertzner in the State quarries at Columbus, Ohio. The horizon is stated to be Onondaga, but it is more probable that the specimen was collected from the Delaware limestone, of Hamilton and Marcellus age.

VASOCRINUS TURBINATUS, new species

In the Springer collection is a single theca of *Vasocrinus* labeled as coming from Louisville, Ky. The specimen is in a splendid state of preservation, the entire cup and the greater part of the tegmen being shown in great detail. It is unfortunate that the specimen can not be referred to *V. valens*, but its close relationship to that species permits the structures shown to be added to those of *V. valens* with the utmost confidence.

Following are measurements of the type and only known specimen:

- Height of dorsal cup, 15 mm.
- Diameter of dorsal cup (ant. R. to Post. IR), 16.5 mm.
- Diameter of stem, 5.4 mm.
- Height of IBB, 2.6 mm.
- Height of BB, 5.8 mm.
- Breadth of BB (average), 6.3 mm.
- Height of RR (average), 4.1 mm.
- Breadth of RR (average), 7 mm.
- Breadth of arm facet (average), 4.5 mm.

As will be noted from the measurements, the height and breadth of the dorsal cup are approximately equal. In form the cup is sub-

turbinate, the sides diverging evenly from the infrabasal circlet to the arm bases, with a slight outward flare at about the top of the basals. The tegmen is low.

The infrabasals form a fairly distinct ring which is, however, not as sharply set off from the remainder of the cup as in the case of *V. valens*. The lower outer margins of the infrabasals are somewhat produced, forming a low rounded interrupted ridge surrounding the base. The basals are variable in size. The posterior and right posterior basals are heptagonal in outline. The r. post. B supports RA on its upper left shoulder. The post. B supports RA on its upper right shoulder and plate x above. The surface of the basals is most elevated near the center of the plate. From this point rounded ridges radiate to the adjacent plates, forming depressed areas along the interbasal sutures as in *V. valens*. In addition to these larger ridges there are inconspicuous folds or ridges crossing from the basals to the radials. The radials are somewhat variable in size. At about the upper level of the arm facets the radials bend over and inward, forming a narrow shelf. The arm facets are directed slightly upward. The radials are pierced by axial canals, which occupy a median position on the arm facets. To either side of the axial canal is a sharply defined articulating facet. RA is large, resting below on the post. and r. post. BB, abutting laterally on r. post. R and x, and supporting rt above. Anal x is still larger and supports two tube plates above. The tegmen is low and is somewhat depressed at each interradius except the posterior, giving it a somewhat lobate appearance. The plates are comparatively heavy, forming a fairly strong rigid tegmen. With the breaking off of the ventral tube a few of the tegmental plates have been lost. The surface of some of the plates has been slightly weathered, giving three or four of them a somewhat roughened and pitted appearance. It is not possible, therefore, definitely to state whether a madreporite is present or not. The stem as shown by the impression of the proximal columnal on the infrabasals is round and pierced by a fairly large pentalobate axial canal. But one brachial is preserved. This is short, stout, and somewhat constricted in its median portion. It is traversed by an axial canal distinct from the food groove. As shown in its proximal portion, the food groove is covered by a series of highly arched covering plates.

This species differs from *V. valens* chiefly in the shape and proportions of the dorsal cup. The straight sides of *V. turbinatus* gradually diverging from the base to the arm facets give it a habit quite at variance with the relatively low rapidly expanding cup of *V. valens*.

Horizon and locality.—The specimen was found in a tray with an assortment of crinoids labeled as coming from Louisville, Ky. As

several of the other specimens bore Lyon's label, it is probable that the specimen was acquired with the Lyon collection. The close relationship of *V. turbinatus* to *V. valens* makes it probable that it came from the same horizon; that is, the Jeffersonville limestone (Onondaga).

Having reestablished the genus *Vasocrinus* on the foundation originally laid by Lyon, it remains to consider the status of *Cyathocrinus hexadactylus* Lyon and Casseday. Wachsmuth and Springer⁴ recognized the identity of Hall's *Cyathocrinus lyoni* with *Cyathocrinus hexadactylus* Lyon and Casseday. They state "Lyon's name has precedence, but being specifically as well as generically incorrect, we adopt Professor Hall's later name." Their action, in those days of loosely applied rules of nomenclature, is not more to be censured than the rather naive mistake of Lyon and Casseday in taking the anal x for a radial and the vertical median range of plates of the ventral sac as an arm. Hence came the "specifically incorrect" *hexadactylus* which we must adopt. Weller⁵ has recognized the validity of Lyon and Casseday's name and places *Cyathocrinus lyoni* Hall in proper synonymy. This species, the structure of which has long been considered typical of *Vasocrinus*, can not be placed in any described genus. It is therefore made the type of a new genus, *Pellecrinus*, and a brief generic diagnosis is here given.

PELLECRINUS, new genus

Dorsal cup low, broad, composed of relatively thin plates. Radial facet horseshoe-shaped, about one-half the width of the radial. Two anal plates in the dorsal cup, rarely one: RA quadrangular, sometimes wanting; x heptagonal, approximately as large as the radials and supporting three tube plates. Ventral sac stout, reaching about one-half the height of the arms. Reaching to about one-half the height of the ventral sac on the posterior side is a median line of heavy plates. The remainder of this side is made up of fairly heavy plates of smaller size. The sides and anterior portion of the sac is composed of thinner plates, most of which show axial folds. The anal opening lies at the apex of the ventral sac. The arms are long, relatively slender, and bifurcate once. The third primibrach is the axillary in all known species except one, when there are but two primibrachs. On each ramus ramuli are borne on alternate sides. In the known species the ramuli are borne by each second secundi-brach. The ramuli themselves on the type species bear subramuli. The stem is large, round in section, and composed of alternate wide

⁴ Wachsmuth, Charles, and Springer, Frank, Revision of the Palaeocrinoidea, pt. 1, p. 96 (321), 1879.

⁵ Weller, Stuart, A bibliographic index of North American Carboniferous invertebrates: U. S. Geol. Survey Bull. 153, 1898.

and narrow columnals. It is perforated by a small obscurely pentalobate canal.

Genotype.—*Cyathocrinus hexadactylus* Lyon and Casseday (*Cyathocrinus lyoni* Hall).

Geological range.—The typical forms of the genus occur in the lower Carboniferous (Mississippian), but undescribed species from the high Middle Devonian have been examined that may be referable to the genus.

EXPLANATION OF PLATES

PLATE 1

The figures within the dotted frame (fig. 10) are photographic copies of Lyon's original illustrations. The numbers 3-3e are the same as Lyon's original numbers.

Vasocrinus sculptus Lyon

FIG. 1. Posterior view of holotype.

FIG. 2. Basal view of holotype.

FIG. 3. Enlargement $\times 3$ of portion of dorsal cup showing detail of weathered plate folds.

FIG. 10 (3c, 3d, 3e). Lyon's original figures of the holotype.

Middle Devonian, Sellersburg limestone (of Hamilton age), Falls of the Ohio, Louisville, Ky.

Vasocrinus valens Lyon

FIGS. 4, 5, 6. Basal, posterior, and left anterior views of specimen referred by Lyon to *V. sculptus*, but here considered as a cotype of *V. valens*.

FIG. 10 (3b). Lyon's figure of the same specimen.

FIGS. 7, 8, 9. Lateral, basal, and ventral view of Lyon's type of *V. valens*, showing the imperfect cup.

FIG. 10 (3a). Lyon's original figure of this specimen.

FIG. 10 (3). Lyon's generic diagram cited as *V. valens*, evidently a composite of his figures 3a and 3b.

Middle Devonian, Jeffersonville limestone (of Onondaga age), quarries on Beargrass Creek, near Louisville, Ky.

PLATE 2

Vasocrinus turbinatus, new species

FIGS. 1, 2, 3. Posterior, tegminal, and anterior views of the holotype.

FIG. 4. Diagram of this specimen, which serves as a generic diagram for *Vasocrinus*.

Middle Devonian, Jeffersonville limestone (of Onondaga age), Louisville, Ky.

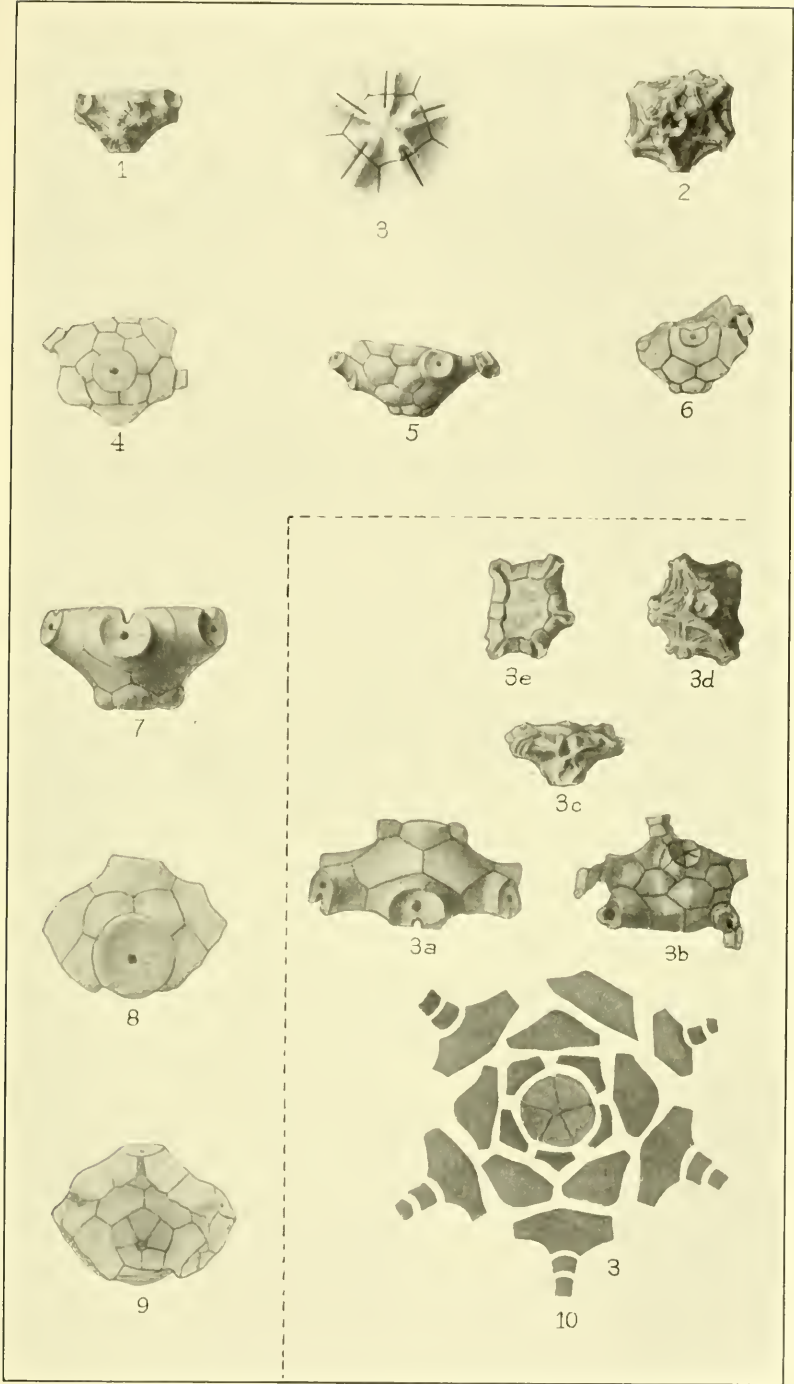
Vasocrinus sculptus Lyon

FIG. 5. Left anterior view $\times 2$ of a small specimen showing the madreporite and two primibrachs with their covering plates. The horizontally disposed structure back of the arm base and to the right is the ventral sac.

FIG. 6. Basal view of large specimen showing two primibrachs in one ray.

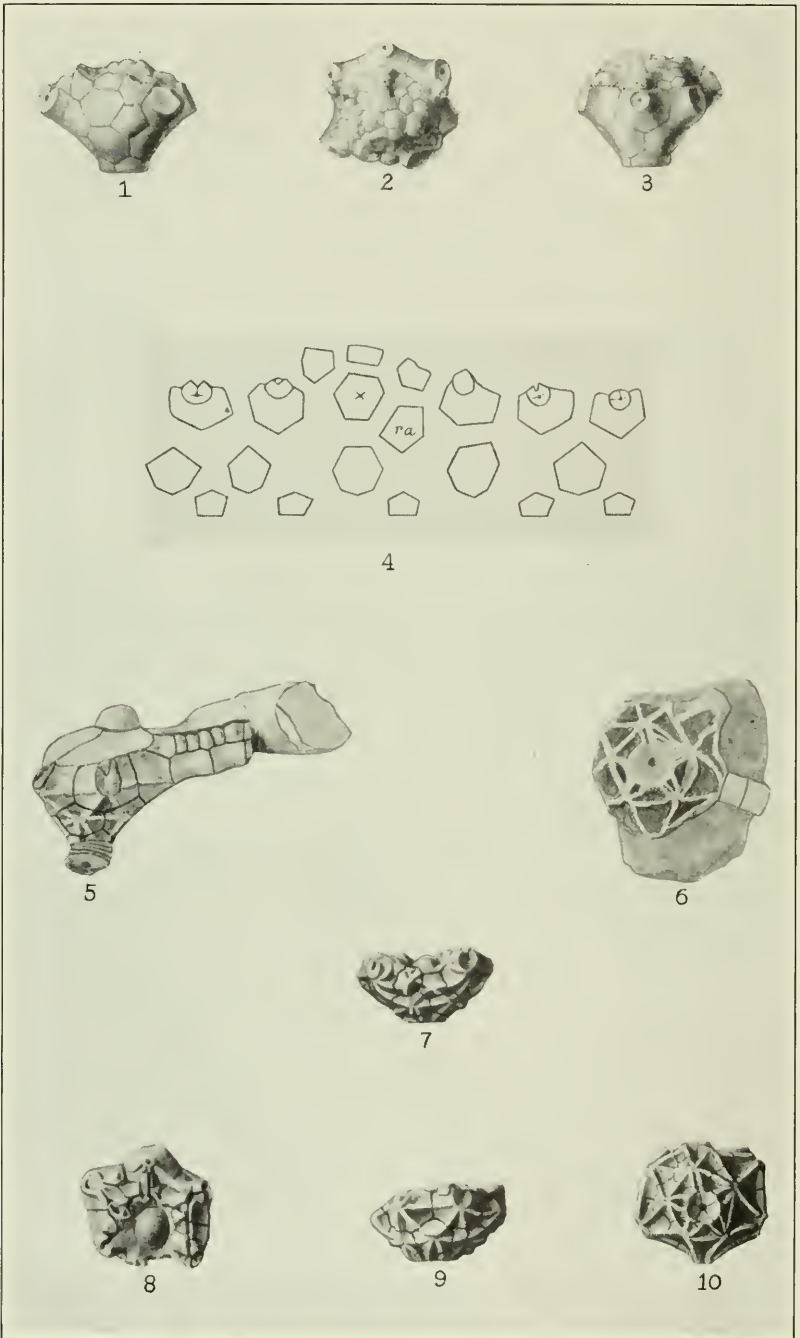
FIGS. 7, 8, 9, 10. Posterior, tegminal, left posterior interrational and basal views of another specimen.

Middle Devonian, Sellersburg limestone (Hamilton), Falls of the Ohio, Louisville, Ky.



SPECIES OF FOSSIL CRINOID GENUS VASOCRINUS

FOR EXPLANATION OF PLATE SEE PAGE 16



SPECIES OF FOSSIL CRINOID GENUS VASOCRINUS

FOR EXPLANATION OF PLATE SEE PAGE 16

A REVISION OF THE NORTH AMERICAN ICHNEUMON-FLIES OF THE GENUS MESOSTENUS AND RELATED GENERA

By R. A. CUSHMAN

Of the Bureau of Entomology, United States Department of Agriculture

Ashmead's tribe Mesostenini was separated off from the Crytini on the basis of the small alar areolet (fig. 6) of its members and an indefinable general appearance or habitus. As I have heretofore pointed out¹ I cannot agree with Ashmead and those who follow him that these differences are of sufficient strength to justify the separation. Certain of the genera, which, because of the small areolet, must be placed in the Mesostenini if that tribe is maintained are much less closely related to *Mesostenus* than to other genera in which the areolet is large. For example, the new genus, *Agonocryptus*, described beyond, is very closely related to *Echthrus* Gravenhorst and to certain Oriental genera (for example, *Megacryptus* Szepliget, and *Torbda* Cameron) in clypeal, tibial, and abdominal characters, whereas only its small areolet allies it to *Mesostenus*.

The insects here treated constitute the North American representatives of the tribe Mesostenini of Ashmead.

KEY TO GENERA TREATED

1. Spiracles of first segment before middle; front tibia in female inflated and basally constricted; seventh tergite in female much longer than sixth, eighth long and scoop-shaped; head narrowed behind eyes, the temples narrow, cheeks swollen and much broader than temples; clypeus broadly truncate, not medially dentate; mandible with lower tooth larger and longer than upper; propodeum long, with two transverse carinae; first tergite in female short and stout, hind tibia nearly or quite a half longer than femur, longer calcarium not reaching middle of basitarsus; tarsus shorter than tibia, apical joint hardly as long as second; ovipositor much shorter than abdomen (figs. 2a, 3b, 6a, 7) ----- *Agonocryptus*, new genus.
- Spiracles of first segment at or behind middle; not agreeing entirely otherwise with above ----- 2

¹ Journ. Wash. Acad. Sci., vol. 15, 1925, p. 389.

2. Spiracles of first segment at or not far behind middle (fig. 2*b-d*), the segment in female either narrow throughout or subclavate; propodeum with more or less distinct basal carina, but with apical carina wanting or at most faintly indicated laterally (fig. 3*c* and 4*l*)----- 3
- Spiracles of first segment far behind middle (fig. 2*e-h*)----- 4
3. Clypeus broadly truncate without an apical tooth; first segment sublinear, curved, the spiracle at or slightly behind middle (fig. 2*b*); propodeum (fig. 3*c*) shining, posteriorly evenly transversely striate; longer hind calcarium reaching beyond middle of basitarsus (fig. 7).

Messatoporus, new genus.

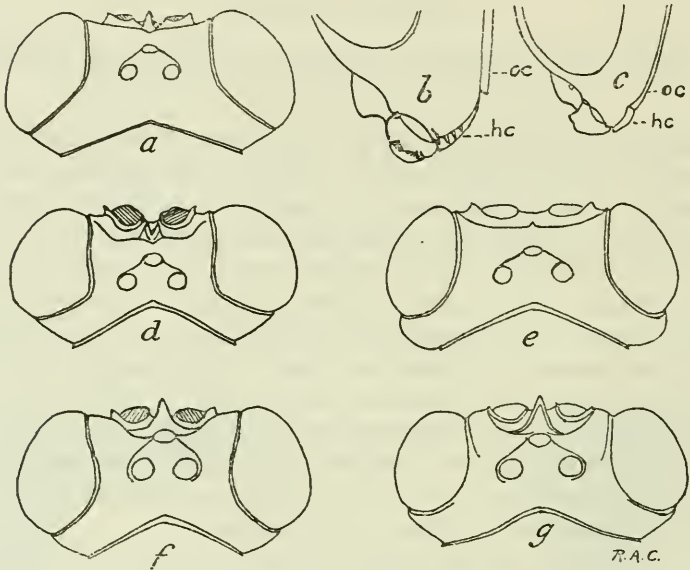


FIG. 1.—HEAD OF: *a*. *LISTROGNATHUS ALBOMACULATUS* (CRESSON), DORSAL VIEW; *b*. SAME, LATERAL VIEW OF LOWER PART TO SHOW OCCIPITAL CARINA (*oc*) AND HYPOSTOMAL CARINA (*hc*); *c*. *LISTROGNATHUS AGNATUS* CUSHMAN, LATERAL VIEW OF LOWER PART; *d*. *POLYAENUS SPINARIUS* (BRULLÉ), DORSAL VIEW; *e*. *MESOSTENUS LEUCOPUS* ASHMEAD, DORSAL VIEW; *f*. *POLYCYRTUS NEGLECTUS* CUSHMAN, DORSAL VIEW; *g*. *POLYCYRTIDEA LIMITIS* CUSHMAN, DORSAL VIEW

- Clypeus medially angulate or toothed; first segment subclavate, straight, the spiracles slightly behind middle (fig. 2*c-d*); propodeum (fig. 3*l*) very long, posteriorly opaque rugoso-punctate; longer hind calcarium not or barely reaching middle or basitarsus----- *Mallochia* Viereck.
4. Propodeum not completely areolated, nearly or quite without longitudinal carinae, rarely with areola more or less defined----- 5
- Propodeum nearly completely areolated (fig. 3*m*)--- *Polistiphaga* Cushman.
5. Postpetiole in female broad, the sternite not or barely reaching the spiracles (fig. 2*e-f*), in male sternite rarely reaching beyond spiracles and then only slightly beyond----- 6
- Postpetiole in female narrow, the sternite reaching distinctly beyond the spiracles (fig. 2*g-h*), in male far beyond, if not so the areolet is very long and narrow----- 9

6. Frons with a single stout horn, rarely indistinct (fig. 1a), abdomen strongly and coarsely punctate-----*Listrognathus* Tschek.
 Frons unarmed or with two minute horns or with a more or less prominent median carina; abdomen very finely coriaceous and not or very weakly punctate----- 7

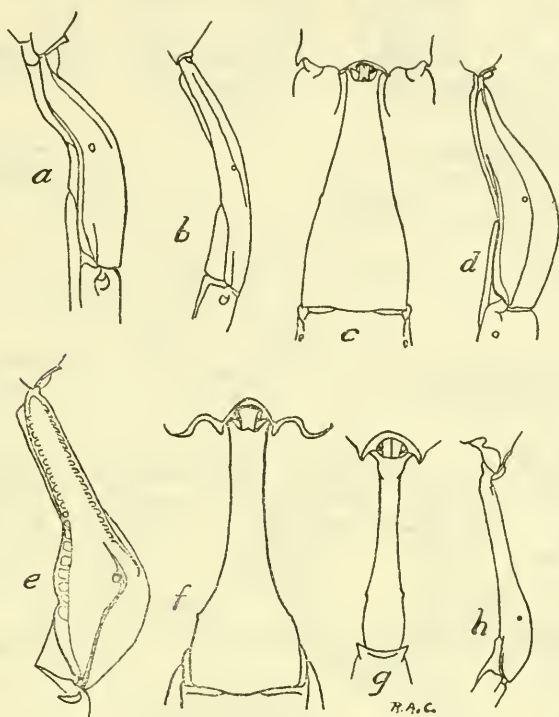


FIG. 2.—FIRST ABDOMINAL SEGMENT OF FEMALE: a. AGONOCRYPTUS DISCOIDALOIDES (VIERECK), LATERAL VIEW; b. MESSATOPORUS DISCOIDALIS (CRESSON), LATERAL VIEW; c. MALLOCHIA AGENIOIDES VIERECK, DORSAL VIEW; d. SAME, LATERAL VIEW; e. LISTROGNATHUS ALBOMACULATUS, LATERAL VIEW; f. CRYPTUROPIS AUDAX (CRESSON), DORSAL VIEW; g. MESOSTENUS LEUCOPUS ASHMEAD, DORSAL VIEW; h. SAME, LATERAL VIEW

7. Areolet pentagonal in position, intercubiti convergent, open at apex, the cubitus bent forward at recurrent and backward at second intercubitus (or its normal position), sometimes subobsolete beyond recurrent, recurrent at or before middle of areolet (fig. 6f and g). *Diapetimorpha* Viereck.
 Areolet elongate or quadrate, intercubiti parallel (sometimes open at apex), recurrent usually much closer to second intercubitus (or its normal position) than to first, cubitus beyond recurrent straight or nearly so (fig. 6h and i)----- 8
8. Frons mutic----- *Crypturopsis* Ashmead.
 Frons bicornute (fig. 1d)----- *Polyaenus* Cresson.
9. Second discoidal cell neither pointed nor strongly narrowed at base----- 10
 Second discoidal cell pointed or very narrow at base (fig. 5)----- 12



FIG. 3.—PROPODEUM OF FEMALE: *a*. *CRYPTUROPUS ABDOMINALIS* CUSHMAN; *b*. *AGONOCRYPTUS DISCOIDALOIDES* (VIERECK); *c*. *MESSATOPORUS DISCOIDALIS* (CRESSON); *d*. *LISTROGNATHUS ALBOMACULATUS* (CRESSON); *e*. *LISTROGNATHUS AGNATUS* CUSHMAN; *f*. *DIAPETIMORPHA INTROITA* (CRESSON); *g*. *DEROCENTRUS MACILENTUS* (CRESSON); *h*. *POLYCYRTUS NEGLECTUS* CUSHMAN; *i*. *ACERASTER PERTINAX* (CRESSON); *j*. *MESOSTENUS THORACICUS* (CRESSON); *k*. *POLYAENUS SPINARIUS* (BRULLÉ); *l*. *MALLOCHIA AGENIOIDES* VIERECK; *m*. *POLISTIPHAGA ZONATA* CUSHMAN

10. Frons unarmed, but frequently with a median carina that, seen from above, may appear as a small horn (fig. 1e), propodeum without distinct apophyses though frequently with apical carina high (fig. 3g and j)— 11 Frons with a stout horn (fig. 1f), propodeum with strong apophyses (fig. 3h). Polycyrtus Spinola.

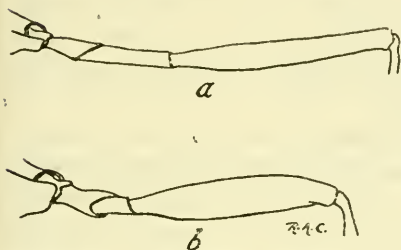


FIG. 4.—HIND TROCHANTER AND FEMUR OF:
a. *DEROCENTRUS MACILENTUS* (CRESSON);
b. *MESOSTENUS THORACICUS* CRESSON

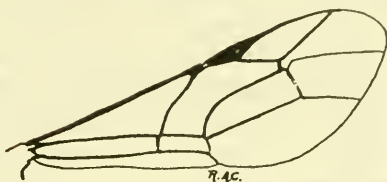


FIG. 5.—FORE WING OF *ACERASTES PERTINAX* (CRESSON)

11. Hind trochantella not longer than trochanter (fig. 4b), ovipositor shorter than body----- *Mesostenus* Gravenhorst.
Hind trochantella much longer than trochanter (fig. 4a), ovipositor much longer than body----- *Derocentrus* Cushman.

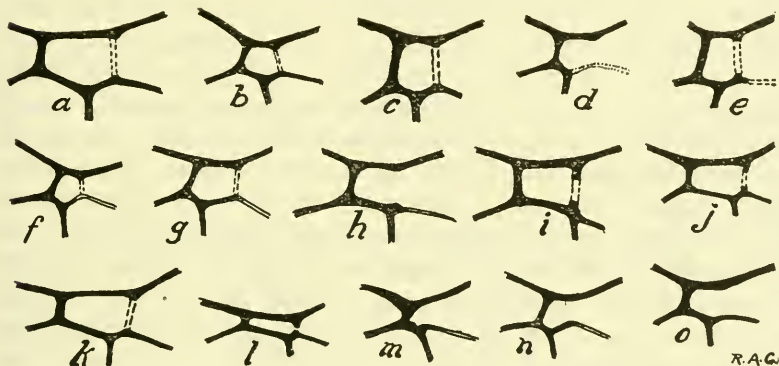


FIG. 6.—THE AREOLET OF: a. *AGONOCRYPTUS DISCOIDALOIDES* (VIERECK); b. *MESSATOPORUS DISCOIDALIS* (CRESSON); c. *MESSATOPORUS MAJOR* CUSHMAN; d. *MALLOCHIA AGENIOIDES* VIERECK; e. *LISTROGNATHUS ALBOMACULATUS* (CRESSON); f. *DIAPETIMORPHA ORBA* (SAY); g. *DIAPETIMORPHA INTROITA* (CRESSON); h. *CRYPTUROPUS TEXANUS* (ASHMEAD); i. *POLYAENUS SPINARIUS* (BRULLE); j. *MESOSTENUS THORACICUS* CRESSON; k. *POLYCYRTUS NEGLECTUS* CUSHMAN; l. *DEROCENTRUS MACILENTUS* (CRESSON); m. *POLYCYRTIDEA LIMITIS* CUSHMAN; n. *ACERASTES PERTINAX* (CRESSON); o. *POLISTIPHAGA FULVA* (CRESSON)

12. Frons (fig. 1g) with a stout horn; areolet (fig. 6m) not defined, second intercubitus missing, radius, first intercubitus and recurrent very close together, nervellus inclivous----- *Polycyrtidea* Viereck.
Frons mutic; areolet (fig. 6n) pentagonal in position, second intercubitus missing, cubitus subobsolete beyond recurrent; nervellus reclivous.

Acerastes, new genus.

AGONOCRYPTUS, new genus²

Closely related to the Neotropical *Monogonocryptus* Viereck and *Digonocryptus* Viereck, but both of those genera have the spiracle of the first abdominal segment behind the middle, the nervulus nearly or quite interstitial, and the clypeus apically more or less distinctly dentate, *Monogonocryptus* with one tooth and *Digonocryptus*³ with two teeth. Otherwise these two genera agree very well with the following description of *Agonocryptus*.

Clypeus inflexed apically and very broadly truncate, mutic; labrum broadly exposed; mandibles with lower tooth larger and longer than upper; head narrowed behind eyes, temples narrow, cheeks swollen and much broader than temples; eyes large and prominent; antennae long and slender filiform, scape deeply, obliquely truncate; flagellum in female slightly flattened in about the basal half, basal joints very long, others successively shorter, apical joint truncate at apex; thorax subcylindrical; notauli deep anteriorly, disappearing in a roughly sculptured area in middle of mesocutum; scutellum weakly convex, not margined; sternauli distinct, propodeum long, with two transverse carinae widely separated, without longitudinal carinae or apophyses, roundly sloping from basal carina, spiracles broadly oval; legs not especially slender, front tibia in female inflated, and basally constricted; hind tibia nearly or quite a half longer than femur, longer calcarium not reaching middle of basitarsus, tarsus distinctly shorter than tibia, apical joint in female hardly as long as second, in male but little longer than fourth; stigma very narrow, radius before middle; discoidal cell not conspicuously narrowed at base; areolet small pentagonal, rather longer than high, intercubiti parallel, second intercubitus obsolete, recurrent at or slightly beyond middle; nervulus distinctly antefurcal, perpendicular to medius; nervellus sharply broken, strongly reclivous, its upper abscissa perpendicular to mediella; abdomen in female lanceolate, in male narrowly subclavate and not apically compressed, spiracles of first segment before middle; in female, first segment stout, decurved, with a blunt tooth on either side below near base, seventh tergite fully as long as third; eighth prominent and scoop-shaped; hypopygium far before apex; ovipositor much shorter than abdomen, deep and bladelike.

Genotype.—*Mesostenus discoidaloides* Viereck. To this genus also belong the following Netropical species:

¹ α-γωνία=without angle, referring to the lack of a tooth on margin of clypeus, by which it is distinguished from some of its closest relatives.

² To this genus, in addition to the genotype, belong the following Neotropical species:

(*Mesostenus*) *Digonocryptus tarsatus* (Cresson) (new combination).

(*Mesostenus*) *Digonocryptus grenadensis* (Ashmead) (new combination).

(*Mesostenus* *insularis* Ashmead, not *insularis* [Cresson] Ashmead) = (*Mesostenus*) *Digonocryptus cressonii* (Ashmead) (new combination).

(*Mesostenus*) *Agonocryptus chichimecus* (Cresson) (new combination).

(*Cryptus*) *Agonocryptus heathi* (Brues) (new combination).

AGONOCRYPTUS DISCOIDALOIDES (Viereck) (new combination)

Figs. 2a, 3b, 6a, 7

Mesostenus discoidaloides VIERECK, Trans. Kansas Acad. Sci., vol. 19, 1905, p. 319, female. Type.—Kans. Univ. Coll.

Discussion based on seven specimens of each sex in the National Collection determined by the author from Viereck's description and from notes on the type by A. B. Gahan.

Female.—Face very slightly narrower than frons, two-thirds as long as broad, usually more or less obliquely rugulose on each side above; malar space three-fourths basal width of mandible; diameter of lateral ocellus two-thirds ocell-ocular line. Thorax coarsely punctate, rugose in pronotal and mesopleural impressions; propodeum transversely rugose in middle between carinae, apical area longitudinally so; nervellus broken at or somewhat above middle. Abdomen coarsely and rather densely punctate, more finely and sparsely so at apex; first tergite sparsely so, polished at base and apex, two-thirds as broad at apex as long; second tergite distinctly longer than broad at base; ovipositor sheath half as long as abdomen.

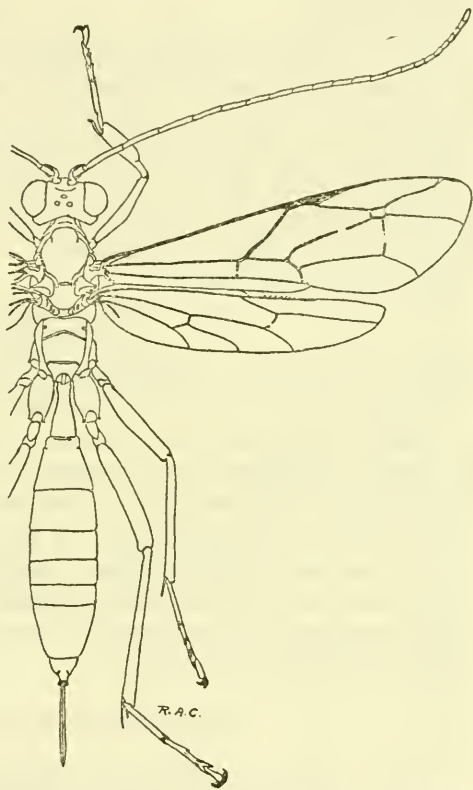


FIG. 7.—AGONOCRYPTUS DISCOIDALOIDES (VIERECK)

Black with profuse yellow markings; head yellow except mandibles at apex, spot in malar space extending up to clypeal foveae, middle of frons and vertex, and occiput which are black or blackish; antenna black with a small spot on scape and a broad annulus centering at about the eighth joint yellow; thorax yellow as follows: Pronotum dorsally and ventrally, propleurum, round or oval median

spot on mesoscutum, scutellum and postscutellum, subalar tubercle, spot below hind wing, lower part of mesopleurum only partially separated from sternum by a black streak along sternaulus (prepectus black); upper and lower divisions of metapleurum largely, and a trifoliate spot covering entire apical slope and position of areola on propodeum; coxae and basal joint of trochanters yellow and black; legs otherwise pale testaceous except hind tarsi, which are yellow with extreme base testaceous and apical two joints blackish; wings hyaline, faintly infumate at apex, venation blackish, stigma reddish; all tergites broadly yellow laterally and all but last apically, first also basally.

Male.—More slender than female with malar space shorter, face narrower, thorax more slender; antennal annulus centering on about the eleventh joint; yellow of head, thorax, and legs somewhat more extensive; hind tibia at apex and basitarsus at base black, tarsus excepting claws otherwise white; abdomen narrower, first and second tergites three or more times as long as broad at their junction, beyond second tergite more or less red with apical yellow bands less distinct and sometimes obliterated.

The type is from Kansas.

The National collection specimens bear data as follows: One female, Lawrence, Kans., August 3, 1896, Hugo Kahl; one female, northern Illinois; one female, Pennsylvania; one female, French Creek, W. Va., reared from larva of *Pseudobidion unicolor* under Quaintance No. 1285, F. E. Brooks; one female, one male, Victoria, Tex., Hunter No. 267, A. C. Morgan; one female, Calvert, Tex., G. H. Harris; one male, Liberty, Tex., March 18, 1906, E. S. Tucker; one male, Jacksonville, Tex., October 11, 1905, C. R. Jones; one male, Texas, Bel-frage; two males, Plano, Tex., reared December 12, 1908, from *Eupogonius vestitus* Say under Hunter No. 1698, E. S. Tucker; one female, Gainesville, Fla., "ecl. No. 1c-5c," H. L. Dozier; one male, Palm Beach, Fla., H. G. Dyar.

MESSATOPORUS, new genus⁴

Clypeus broadly truncate at apex, mutic; labrum prominent; mandibles long and apically very narrow, upper tooth larger and longer than lower; head strongly narrowed behind eyes, cheeks not swollen; eyes large and prominent, malar space very short; antennae as long as body, slender, scape deeply obliquely truncate, flagellum with basal joints long and slender, others gradually shorter toward apex, flagellum apically sometimes flattened; especially in female; thorax much deeper than broad, notauli deep, nearly parallel for most of their length but curving sharply posteriorly and meeting in

⁴ From μέσσας=quite in the middle, and πορος=opening, referring to the location of the spiracles of the first abdominal segment.

a deep depression at about the posterior third of the mesoscutum; scutellum convex, not margined; sternauli deep, complete; propodeum rather long, with the basal carina strong and nearly straight and apical carina absent or slightly indicated laterally, without longitudinal carinae, basad of basal carina polished, strongly transversely striate beyond, spiracles elongate; legs slender, hind coxae large, front tibia in female slightly inflated and weakly constricted basally, hind tibia not nearly a half longer than femur, longer calcarium reaching far beyond middle of basitarsus, tarsus subequal in length to tibia, apical joint in female hardly as long as third, in male little longer than fourth; fourth joint of all tarsi, especially in female and especially on front tarsus prolonged on outer side below; stigma very narrow, radius slightly before middle; discoidal cell not conspicuously narrowed at base; areolet small, pentagonal, about as long as high, intercubiti parallel or nearly, second intercubitus obsolete, recurrent at or beyond middle; nervulus distinctly antefurcal, perpendicular to medius or slightly inclivous; nervellus sharply broken, strongly reclivous, upper abscissa perpendicular to mediella; abdomen in both sexes broadest distinctly beyond middle, first segment slender, decurved, spiracles at or very near the middle; apical tergites in female not conspicuously long; ovipositor sheath shorter than abdomen, ovipositor slender cylindrical.

Genotype.—*Mesostenus discoidalis* Cresson.

The four North American species known to me are distinguishable by the following key:

1. Clypeus not apically inflexed; antennae not at all compressed apically; propodeum with lateral traces of apical carinae; subdiscoideus below upper third of postnervulus..... 2
Clypeus apically inflexed; antennae apically compressed, more strongly so in female; propodeum without trace of apical carina; subdiscoideus at or above upper third of postnervulus..... 3
2. Abdomen with alternate bands of black and white..... *discoidalis* (Cresson).
Abdomen red, bases of segments usually more or less darker, first segment whitish at base and apex..... *rufiventris*, new species.
3. Eyes distinctly convergent below..... *compressicornis*, new species.
Eyes hardly convergent below..... *major*, new species.

MESSATOPORUS DISCOIDALIS (Cresson) (new combination)

Figs. 2b, 3c, 6b, 8.

Mesostenus discoidalis CRESSON, Trans. Amer. Ent. Soc., vol. 4, 1872, p. 162, female. *Type*.—Cat. No. 1575, U.S.N.M.

Mesostenus jocosus PROVANCHER, Nat. Can., vol. 6, 1874, p. 300, female; Nat. Can., vol. 11, 1879, p. 112, female; Faune Ent. Can. Hymn., 1883, p. 346, female. *Type*.—Public Mus. Quebec (new synonymy).

Discussion based on type and 10 other females and 8 males, all in the National collection.

Length, 8–9 mm.

Temples nearly flat; occipital carina not very prominent; vertex behind ocelli only slightly higher than at posterior ocelli; frons weakly impressed in middle; eyes convergent below in about the ratio 5:4; combined face and clypeus very slightly longer than broad, face rather densely finely punctate with a distinct longitudinal im-

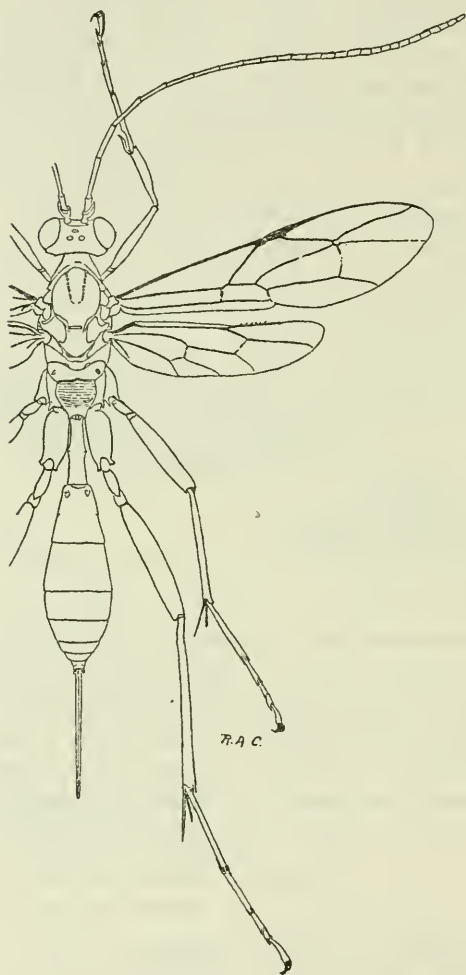


FIG. 8.—*MESSATOPORUS DISCOIDALIS* (CRESSON)

pression on each side of middle; clypeus nearly half as long as interfoveal line, sloping toward apex but not distinctly inflexed, broadly truncate at apex; antennae as long as body; flagellum cylindrical throughout, slightly thicker toward apex. Thorax shining but not polished, rather densely finely punctate, foveolate along the lateral sutures and sternauli, pronotal and subalar impressions striate; scutellum weakly convex; apical carina of propodeum more or less distinct laterally; subdiscoideus below upper third of postnerve; coxae opaque, densely and finely punctate. Abdomen, except first tergite, subopaque, very finely coriaceous; ovipositor sheath as long as abdomen exclusive of first tergite.

Black with profuse pale yellow or white markings as follows: Broad uninterrupted orbits, face, clypeus, mandibles at base, scape in front, broad annulus on flagellum centering on joints 10-11, up-

per and anterior margins of pronotum, propleura largely, spot on disk of mesoscutum sometimes prolonged toward the front along notauli, scutellum and its basal carinae, pleura and mesopleurum and meta- and mesosternum except more or less broadly along sutures and usually sternauli, metasternum entirely, upper division of meta-pleurum confluent with a median spot behind postscutellum, propodeum behind carina except oval median apical spot, base of first

segment, broad apices of tergites 1-7 and 8 except in middle above; front leg stramineous with more or less distinct darker streaks on upper surface of trochanter and femur and flexor surface of tibia, and frequently on upper surface of coxa; middle leg more testaceous with dark markings faint or absent; hind leg testaceous, coxa with upper surface yellowish and flanked on outer side toward base by a dark streak, tibia near base more or less distinctly pale, at apex and basitarsus at base black, tarsus otherwise white, calcaria apically more or less, usually largely, white; wings hyaline, veins dark, stigma pale.

Male.—Smaller and more slender, and less distinctly sculptured and more polished than female; face narrower and eyes less strongly convergent; annulus centering on flagellar joints 13-14; front and middle legs and hind coxae paler; hind tibia white at base, black at apex, and only obscurely red in middle; tergites more or less red between basal black and apical white.

The National collection specimens bear the following data: Type and three other specimens, Texas, Belfrage; Victoria, Tex., two specimens, J. D. Mitchell, one reared March 23, 1909, "from mud-wasp," and one reared January 10, 1916, under Hunter No. 3748-1 from *Agenia petiolata* (Cresson); one, Dallas, Tex., April 24, 1907, F. C. Bishopp; one, Kansas; one, Riley County, Kans., May 25, F. Marlatt; one, Boulder, Colo., September, Cockerell; one, Rockford, Ill., reared December 17, 1920, from *Ceropales fraterna*; one, Plummer Island, Md., June 25, 1920, H. S. Barber; one Cabin John, Md., September 13, 1917, R. M. Fouts; one, Georgetown, D. C., H. H. Smith; one, Carlisle Junction, Pa., August 28, 1909, W. S. Fisher; one, Durham, N. H., Weed and Fiske; and two without locality, reared, one on April 24, 1884, from *Agenia bombycisa* by T. Pergande, and one from old nest of *Sceliphron caementarium* inhabited by *Pseudagenia mellipes*.

MESSATOPORUS RUFIVENTRIS, new species

Structurally I can see no difference between this and *discoidalis* (Cresson), and am inclined to think it merely a color variation. But in the absence of a good variation series I deem it wiser to describe it as distinct. One of the specimens was compared by S. A. Rohwer with the type of *Mesostenus jocusus* Provancher and determined by him as that species in spite of the difference in abdominal coloration.

Female.—Length, 8 mm.

Differs from *discoidalis* practically only in color of abdomen, which is red with tergites more or less darker at base, the first yellow at base and apex.

Type-locality.—Cabin John, Md.

Type.—Cat. No. 40579, U.S.N.M.

Nine females showing about the same distribution as *discoidalis*. Type taken August 5, 1917, by R. M. Fouts; two, Glen Echo, R. M. Fouts; one, Glencarlyn, Va., August 18, 1912, J. R. Malloch; one Langdale, Ala., H. H. Smith; one, Texas, Belfrage; one, Boulder County, Colo., May 9, 1926, Charles H. Hicks, under his No. 150; one, Quebec Province, Canada; and one without data.

MESSATOPORUS COMPRESSICORNIS, new species

This and the following species are very easily distinguishable from the other two species by the characters used in the key, especially in their distinctly compressed antennae.

Female.—Length, 9 mm.

Temples rather strongly convex; occipital carina high; vertex behind ocelli distinctly higher than at posterior ocelli; frons with a deep median groove; eyes convergent below in the ratio 5:4; combined face and clypeus barely as long as broad, face distinctly shagreened and very sparsely punctate; clypeus barely a third as long as interfoveal line, distinctly inflexed from middle and with a distinct reflexed margin, apex very broadly and slightly concavely truncate; antennae as long as body, flagellum very slender at base, strongly flattened toward apex. Thorax polished, at most very sparsely punctate, sternauli and prepectal suture not foveolate, mesopleural groove foveolate, pronotal impression striate, subalar impression smooth; scutellum strongly convex; apical carina entirely wanting; subdiscoideus above upper third of postnervulus; coxae polished, sparsely and coarsely punctate. Abdomen subpolished; sheath as long as abdomen beyond first tergite.

Color and color pattern much as in *discoidalis*, but differing as follows: Scape not pale in front; antennal annulus centering on seventh flagellar joint; several of the sutures of flagellum beyond the annulus with a small white spot on outer side below; post-scutellum pale; all coxae pale yellow with larger or smaller black markings above and below; front and middle trochanters and basal joint of hind trochanter yellow, the middle and hind ones black at base; front and middle femora testaceous; front and middle tibiae and tarsi stramineous; hind tibia testaceous, paler at base and black at apex; hind tarsus white, extreme base black; calcaria black, apically reddish.

Male.—More slender than female; face narrower; flagellum less strongly compressed at apex; scape pale in front; annulus centering on flagellar joint 10; front and middle legs paler and practically without black markings; apical joint of hind trochanter largely black, tibia black and white.

Type-locality.—Inglenook, Pa.

Allotype-locality.—Speeceville, Pa.

Type.—Cat. No. 40580, U.S.N.M.

Five females and one male as follows: Type taken in August by J. N. Knull; allotype July 8, 1909, by P. R. Myers; District of Columbia, July and August; Thomasville, Alabama, April 20, 1910, W. D. Pierce.

MESSATOPORUS MAJOR, new species

Fig. 6c

Very closely related to *compressicornis* and perhaps only a large specimen of that species differing slightly in structure of head and color of legs as follows:

Female.—Length, 13 mm.

Eyes only very slightly convergent below; front and middle tibiae testaceous, middle tarsi fusco-testaceous; sheath very nearly as long as abdomen.

Type-locality.—Orlando, Fla.

Type.—Cat. No. 40581, U.S.N.M.

One female, October 13, 1925, O. C. McBride.

Genus MALLOCHIA Viereck

Mallochia VIERECK, PROC. U. S. NAT. MUS., vol. 43, 1912, p. 591. *Genotype*.—*Mallochia ageniodes* Viereck.

Head transverse, temples convexly narrowed; clypeus small, arcuately truncate and medially more or less distinctly toothed at apex; eyes large, somewhat bulging; frons unarmed; mandibles short, upper tooth slightly larger and longer than lower; scape obliquely truncate; flagellum filiform, in female somewhat thickened toward apex. Thorax long subcylindrical, propodeum very long with basal carina obsolete to distinct, other carinae absent, spiracles small circular; notauli distinct anteriorly but not deep; sternauli obsolete; scutellum nearly flat; wings narrow, stigma small, radius slightly before middle, radial cell short, areolet small pentagonal, cubitus beyond second recurrent and second intercubitus weak, nervulus antefurcal, subdiscoideus far above middle of postnervulus, nervellus strongly reclivous, its upper abscissa perpendicular to cubitella; legs long and slender, longer hind calcarium not or barely half as long as basitarsus, front tibia in female neither inflated nor basally constricted. Abdomen long fusiform in female, very narrow and subclavate in male; first segment short, straight, gradually widened toward apex, spiracles slightly behind middle; apical tergites in female short; ovipositor sheath much shorter than abdomen; thin, sagittate at apex.

The two North American species are distinguishable as follows:

1. Head behind eyes much narrower than at eyes; front wings bifasciate;
female only----- *agenioides* Viereck.
Head behind eyes nearly as broad as at eyes; wings hyaline throughout;
male only----- *strigosa* (Cresson).

MALLOCHIA AGENIOIDES Viereck

Figs. 2c-d, 3l, 6d

Mallochia agenioides VIERECK, Proc. U. S. Nat. Mus., vol. 43, 1912, p. 591, female.
Type.—Cat. No. 15036, U.S.N.M.

Observations based on type and one other female.

Female.—Temples much narrower than eyes, their cephalo-caudad length little more than a third the shortest diameter of eye; occipital carina joining hypostomal carina some distance behind mandible; cheeks much broader than temples; vertex, frons, face, and clypeus basally closely and finely punctate; clypeus half as long as interfoveal line; malar space three-fourths basal width of mandible; antennae two-thirds as long as body, first four flagellar joints elongate and successively gradually shorter, fifth abruptly shorter, subapical joints about as long as thick. Thorax twice as long as deep, finely and closely punctate, pronotal depression striate, scutellum polished; propodeum rather steeply sloping apically, opaque, finely rugulose punctate, basal carina obsolete. Abdomen finely punctate opaque, first tergite nearly polished, very faintly shagreened; first tergite two and a half times as long as broad at apex, postpetiole slightly longer than broad; second tergite twice as long as broad at base; ovipositor sheath half as long as abdomen.

Ferruginous with orbits, face, clypeus, mandibles basally, propleura, front legs, and scutellum paler; mandibles apically, ovipositor sheath, and apical joint of hind tarsus blackish; flagellum beyond middle of first joint blackish with an incomplete white annulus centering on joint 7; wings hyaline with transverse clouds in front wing opposite apex of costa and apex of radius.

The second specimen was captured May 27, 1911, at Anacostia, D. C., by P. R. Myers.

MALLOCHIA STRIGOSA (Cresson) (new combination)

Mesoleptus ? *strigosus* CRESSON, Trans. Amer. Ent. Soc., vol. 4, 1872, p. 167, male. Type.—Cat. No. 1604, U.S.N.M.

Gausocontrus ? *strigosus* (Cresson) DAVIS, Trans. Amer. Ent. Soc., vol. 24, 1897, p. 311, male.

Nematopodius longicaudus ASHMEAD, Proc. Wash. Acad. Sci., vol. 4, 1902, p. 201, male (not female).

The unique type from Texas is the only known specimen of this species.

Except for its broader temples and hyaline wings it differs from *agenioides* Viereck markedly only in its much more slender body and I suspect it is the male of that species. The temples are about half as long as shortest diameter of eye; the thorax about three times as long as deep with the propodeum sloping very gradually to apex; the first tergite is fully three times and the second nearly four times as long as broad at their junction; the hind coxae are very long and slender; and the antennae without a white annulus.

Genus LISTROGNATHUS Tschek

Listrognathus TSCHÉK, Verh. Zool.-bot. Ges. Wien, vol. 20, 1870, p. 153. *Genotype*.—*Listrognathus cornutus* Tschek.

Mesostenoides ASHMEAD, Proc. U. S. Nat. Mus., vol. 23, 1900, p. 45. *Genotype*.—*Mesostenus albomaculatus* Cresson.

Listrognathus (Tschek) CUSHMAN, Journ. Wash. Acad. Sci., vol. 15, 1925, p. 390.

Viereck's synonymizing of *Mesostenoides* with *Polycyrtus* Spinola is obviously incorrect, as I have previously pointed out.

As I have shown in the reference cited above the type of *Mesostenoides* will not run to that genus in Ashmead's key because of the frontal horn.

Quite as characteristic of this genus as the frontal horn is the coarse, dense abdominal punctuation.

Temples strongly, obliquely narrowed; frons usually with a distinct horn, rarely with only the trace of such a horn; eyes parallel within or nearly so, clypeus convex, usually very strongly elevated, at base, transversely impressed at apex; malar space long; occipital carina usually very prominent behind cheeks; hypostomal carina very high; antennae long, slender, flagellum in female slightly thickened and flattened below toward apex, first joint much longer than second, which is slightly longer than third, fourth much shorter than third, in male flagellum tapering beyond middle, joints gradually shorter from base. Thorax stout, about twice as long as deep and slightly deeper than broad, densely and coarsely punctate with propodeum usually more or less rugose; upper margins of pronotum swollen and anteriorly carinately angled by the epomia; notauli distinct and complete, scutellum margined only at extreme base, convex, polished and at most sparsely punctate; sternauli deep anteriorly, obsolete posteriorly; propodeum with both transverse carinae and frequently with median carinae more or less indicated between the transverse carinae, apical carina sometimes obsolete medially, apophyses well developed or indicated by strong elevations in apical carina, spiracles elongate or oval; areolet subquadrate or subpentagonal, closed, recurrent near apex; nervulus antefurcal; postnervulus broken below

middle; nervellus broken below middle, its upper abscissa nearly or quite perpendicular to cubitella; legs slender, front tibia in female not inflated. Abdomen fusiform, narrower in male, coarsely punctate, first tergite bent, postpetiole broad, usually with a prominent flange-like carina on lower margin; sheath much shorter than abdomen.

The North American species may be distinguished by the following key:

1. Occipital carina prominently toothed a short distance before reaching hypostomal carina⁵ (fig. 1b); abdomen black, the tergites conspicuously banded with white apically..... *albomaculatus* (Cresson).
Occipital carina not prominently toothed (fig. 1c); abdomen red on black with at most the apical tergites narrowly white apically..... 2
2. Apical carina obsolete medially or much weaker than at apophyses; areola wanting; apical tergites margined with white..... *multicolor*, new species.
Apical carina of propodeum distinct throughout, apophyses not much stronger than middle; areola more or less defined (fig. 3e); apical tergites not margined with white..... 3
3. Frontal horn black..... *agnatus*, new species.
Frontal horn white..... *paludatus* (Cresson).

LISTROGNATHUS ALBOMACULATUS (Cresson)

Synonymy and description under varietal heading.

A very variable species that is divisible on the basis of specimens studied, into five more or less distinct varieties, recognizable by the following key:

1. Lower division of metapleurum partly white..... 2
Lower division of metapleurum entirely black..... 3
2. Hind tibia and basitarsus red..... *rufitibialis*, new variety.
Hind tibia black or blackish with a subbasal yellow annulus, basitarsus yellow..... *multimaculatus*, new variety.
3. Hind coxae red and white; fore wing in female with a distinct cloud below stigma..... variety *nubilipennis* (Cresson).
Hind coxae black or black and white..... 4
4. White bands of abdomen in female, at least on tergites 2 and 3 interrupted at sides; mesoscutum immaculate, mesopleurum nearly or quite so; face in female medially immaculate; antenna in male without white annulus.
variety *sagax* (Provancher).
White abdominal bands entire; mesoscutum and mesopleurum with white spots; face in female usually more or less white medially; antenna in male with white annulus..... variety *albomaculatus* (Cresson).

LISTROGNATHUS ALBOMACULATUS variety ALBOMACULATUS (Cresson)

Figs. 1a-b, 2e, 3d, 6e

Mesostenus albomaculatus CRESSON, Proc. Ent. Soc. Philadelphia, vol. 3, 1864, p. 313, female.—ASHMEAD, Smith; Ins. of N. J., (1899) 1900, p. 570.
Type.—No. 1108, Acad. Nat. Sci. Phila.

⁵ The carina running backward from the ventral articulation of the mandible along the outer side of maxilla.

Mesostenus leucocoxus ASHMEAD, Proc. U. S. Nat. Mus., vol. 12, 1890, p. 407, male. Type.—Cat No. 2019, U.S.N.M.

Mesostenoides albomaculatus (Cresson) ASHMEAD, Proc. U. S. Nat. Mus., vol. 23, 1900, p. 45.

Polycyrtus albomaculatus (Cresson) VIERECK, Proc. U. S. Nat. Mus., vol. 42, 1912, p. 644.

Mesostenidea (*Polycyrtus*) *albomaculata* (Cresson) VIERECK, Hym. Conn., (1916) 1917, pp. 329 and 330.

Listrognathus albomaculatus (Cresson) CUSHMAN, Journ. Wash. Acad. Sci., vol. 15, 1925, p. 391.

Listrognathus leucocoxus (Ashmead) CUSHMAN, Journ. Wash. Acad. Sci., vol. 15, 1925, p. 391.

Discussion based on type, a specimen compared with the type by the writer, type of *leucocoxus*, and nine other females and two other males.

Female.—Length, 8-12 mm.

Temples and vertex behind ocelli sharply sloping, densely and coarsely punctate; frons medially irregularly rugose; face medially rugose punctate; inner orbits and malar space finely coriaceous and sparsely punctate; eyes parallel; malar space about three-fourths as long as basal width of mandible, occipital carina very prominent below; clypeus very prominent; antennae nearly as long as body, fourth flagellar joint three-fourths as long as third. Thorax coarsely, mostly confluent punctate, pronotum laterally and mesopleurum above striately rugose; scutellum subpolished, sparsely punctate; propodeum reticulate rugose; apical carina obsolete medially, apophyses prominent. Basal tergites punctate, postpetiole coarsely and rather sparsely so, second coarsely and confluent so; apical tergite polished, impunctate; sheath hardly half as long as abdomen; ovipositor stout, compressed, depressed beyond dorsal angle.

Black with whitish markings as follows: Orbits except behind top of eyes; usually two small spots on middle of face, sometimes wanting and sometimes confluent; clypeus basally; spot on upper margin of mandible; broad, ventrally incomplete, annulus, centering about on joint 8 or 9 of flagellum and usually a spot on under side of scape; anterior and humeral margins of pronotum, median spot on mesoscutum; scutellum largely and postscutellum; tegulae; subalar tubercle; a large mark below on mesopleurum; upper division of metapleurum; a large longitudinal mark on each side of posterior face of propodeum including the apophyses; and apical bands on tergites 1-6, those on 2 and 3 not interrupted laterally, extreme apex of 2 narrowly black; wings yellowish hyaline, sometimes with a faint trace of a cloud below stigma, venation dark brown; legs testaceous; front and middle coxae largely whitish, more or less black at base and sometimes at apex above; hind coxa black with a whitish spot above, hind knees black, tibia blackish, pale subbasally;

tarsus white, basitarsus with a more or less distinct dark subbasal annulus, apical joint red.

Male.—Much like female but antennae slightly longer than body and with annulus centering about on flagellar joint 14 or 15 and scape entirely white below; face entirely, clypeus and mandibles except apex whitish; seventh tergite also white at apex.

The type is from Pennsylvania and that of *leucocoxus* from Missouri. The other United States National Museum specimens are as follows: A female, Castle Rock, Pa., September 7, 1901; a male, Lyme, Conn., May 18, 1918, W. S. Fisher; five females, Cabin John, Md., July 1–August 21, R. M. Fouts; a female, Glen Echo, Md., September 17, 1918, R. M. Fouts; a female, Virginia, August 5, 1883, T. Pergande; a female, Wooster, Ohio, June 1, 1897; one male, Urbana, Ill., July 15, 1893, Hugo Kahl; and a female, Cadet, Mo., J. G. Barlow.

LISTROGNATHUS ALBOMACULATUS RUFITIBIALIS, new variety

Female and male.—A southern variety extending as far north on the Atlantic Coast as New Jersey. Differing from all other varieties in its red hind tibia and basitarsus and from all but *multimaculatus* in the white maculate lower division of metapleurum. The yellow markings are somewhat more extensive than in the typical form; in the female the median facial spot is usually confluent with the orbital ring.

Type-locality.—Plummer Island, Md.

Allotype-locality.—Heckton Mills, Pa.

Type.—Cat. No. 40582, U.S.N.M.

Described from three females and seven males, the type taken July 21, 1920, by H. S. Barber and the allotype June 6, 1909, by W. S. Fisher; a male with same data as allotype except May 21, 1909; a female, Lucaston, N. J., August 27, 1905; a male, Pyziton, Ala., H. H. Smith; two males, Dallas, Tex, April 8, 1906, F. C. Bishopp, and March 6, 1907, R. A. Cushman; two males, Plano, Tex., October and November, E. S. Tucker; and one female, Lawrence, Kans., Hugo Kahl.

LISTROGNATHUS ALBOMACULATUS MULTIMACULATUS, new variety

Female.—Differs from the typical form in the possession of a large white spot on lower division of metapleurum; in the generally somewhat larger spots, especially noticeable on the face, where the median spot is usually confluent with the orbital markings; orbital ring sometimes complete; hind tibia black at apex, this color grading off to fuscous red toward base; hind basitarsus entirely white.

Type-locality.—Carlisle Junction, Pennsylvania.

Type.—Cat. No. 40583, U.S.N.M.

Three females, the type captured August 28, 1909, by W. S. Fisher; one from New York; and one from Riley County, Kans., November, Marlatt.

LISTROGNATHUS ALBOMACULATUS variety *NUBILIPENNIS* (Cresson)

Mesostenus nubilipennis CRESSON, Can. Ent., vol. 10, 1878, p. 205. *Type*.—No. 1184, Acad. Nat. Sci. Phila.

Discussion based on type.

Differs from typical form in having the hind coxae largely red and in having a distinct, though not deeply infumate, cloud in the front wing.

Cresson says "frons unarmed", but the structure of the frons is the same as in specimens with the horn. There is great variation in the size of the horn, and the reduction in size is apparently carried to the extreme in this specimen.

A male from Vienna, Va., April 22, 1915 (R. A. Cushman), which I have somewhat doubtfully determined as this variety has a distinct frontal horn, lacks the alar cloud, and has the hind coxae red and only slightly paler above.

The type is from Georgia.

LISTROGNATHUS ALBOMACULATUS variety *SAGAX* (Provancher)

Mesostenus sagax PROVANCHER, Nat. Can., vol. 11, 1879, p. 112, fig. 2e, female; Faune Ent. Can. Hym., 1883, p. 345, fig. 35c, female. *Type*.—Public Museum, Quebec.

Discussion based on notes by S. A. Rohwer on type and three females and one male in the National collection determined by the writer.

According to Rohwer's notes the type will run in Ashmead's key to *Mesostenoides*, which would indicate that the frons is unarmed, but one of the females in the National collection agrees so nearly perfectly with Provancher's description and with the additional characters in Rohwer's notes that the determination appears correct.

So identified this form is probably nothing but a more or less melanic variation of the species hardly worthy of varietal rank.

In its extreme form as represented by the type the head is entirely without white markings; on the thorax only the scutellum and apophyses are white marked; and the coxae are entirely black.

In the National Museum specimen that approaches closest to the type in coloration the frontal orbits are narrowly white; there are small white spots on dorsal margin of pronotum, base of tegula, subalar tubercle, and upper side of middle coxa. In the most highly ornamented specimen these markings are larger, the orbital mark extends to the sides of the face, and there are additional white markings on cheeks, clypeus, mandibles, lower corner of pronotum,

lower margin of mesopleurum, postscutellum, upper division of metapleurum and all coxae.

The only characters in which all agree and in which they differ from the typical variety are the interrupted apical bands of tergites 2 and 3 and the medially immaculate face.

In the male the orbits are more broadly white from frons around to cheeks, the face is medially white, clypeus and mandibles partly white, scape white below, flagellum entirely black; tegulae, humeral margin of pronotum, subalar tubercle, postscutellum, front and middle coxae and trochanters beneath white; front and middle coxae and trochanters above, hind coxa and basal joint of trochanter entirely, apex of femur, basal and apical joints of tarsus black; second joint of hind tarsus dusky; apical bands of tergites 2 and 3 not interrupted; seventh tergite apically white.

The type is from Cap Rouge, Quebec; the most nearly typical female of the National collection and the male from Edmonton, Alberta, April 5, 1924, George Salt; and the two other females from Canada (C. F. Baker collection); and Lyme, Conn., June 15, 1918, W. Middleton.

LISTROGNATHUS MULTICOLOR, new species

Female.—Length 8 mm.

Temples strongly sloping, straight, distinctly, though not densely, punctate; frons medially rugose above, polished below, horn large; face finely alutaceous, coarsely punctate; clypeus moderately elevated; malar space subequal to basal width of mandible; occipital carina not prominent below; antennae nearly as long as body. Thorax densely and coarsely punctate, pronotum laterally, mesopleurum and metapleurum partly, rugoso-striate; propodeum with apical carina obsolete medially, apophyses low carinate, obliquely striate rugose between the carinae, posterior face reticulate rugose; nervulus distinctly antefurcal; nervellus perpendicular to cubitella. Abdomen densely, rather coarsely punctate on tergites 2–3, postpetiole sparsely punctate; sheath hardly half as long as abdomen; ovipositor as in *albomaculatus*.

Head and thorax black with the following white markings; anterior orbits, very narrow on face; a spot on cheek; middle of clypeus; spot on mandible; upper side of ninth flagellar joint; small spots on humeral margin of pronotum, tegula, subalar tubercle, and scutellum; and a spot on each side of posterior face of propodeum, including apophyses; wings yellowish hyaline; legs testaceous; front and middle coxae more or less whitish above; hind tibia dusky red, blackish at base and apex, with an indefinite yellowish subbasal annulus; tarsus dusky, basal and apical joints nearly black, joints 1–4 pale at

base; abdomen ferruginous, apical tergites more or less black, tergites 4-7 with narrow white margins.

Type-locality.—California.

Type.—Cat. No. 40584, U.S.N.M.

Two females, the paratype from Kaslo, British Columbia (R. P. Currie).

The paratype is smaller than the type. It lacks the orbital markings on sides of face and on cheeks; clypeus is only faintly maculate and the mandibles entirely black; the antennal annulus occupies joints 9-11; the spots on the thorax are smaller, and those on the subalar tubercles and propodeum are wanting; and the fourth tergite lacks the apical white band.

LISTROGNATHUS AGNATUS, new species

Figs. 1c, 3c

Female.—Length, 8 mm.

Head rather thick antero-posteriorly, the temples convexly oblique, strongly punctate; frons polished, almost without sculpture, horn fairly large; face slightly widening below, coriaceous, medially rather densely punctate; clypeus convex basally, but not especially prominent; malar space about three-fourths basal width of mandible; occipital carina not prominent below; antennae (broken). Thorax rather more finely sculptured than usual for the genus; propodeum with both basal and apical carinae distinct throughout and with the areola obsoletely defined laterally, about as long as broad with costulae near base, apophyses low carinate, apical slope flat; nervulus strongly antefurcal; nervellus slightly inclivous, its upper abscissa oblique to cubitella. Abdominal sculpture rather finer than usual; postpetiole shining, punctate only around margins and these sparsely so; sheath little more than a third as long as abdomen; ovipositor rather slender, slightly compressed, dorsal margin beyond angle straight.

Black; narrow frontal orbits and sometimes narrower facial orbits, humeral margins of pronotum, tegulae, subalar tubercles, spot on scutellum, sometimes a spot on each side of posterior face of propodeum and joints 2-4 of hind tarsus white; hind femur at apex, tibia, and basitarsus black, the tibia indefinitely paler subbasally; wings hyaline, venation brown, stigma paler; abdomen black, first tergite very dark reddish piceous, second and third very narrowly margined with pale reddish.

Type-locality.—Southern Illinois.

Type.—Cat. No. 40585, U.S.N.M.

Three females, none entire.

These bear an Ashmead manuscript name indicating an association with the lepidopterous genus *Orgyia*.

LISTROGNATHUS PALUDATUS (Cresson)

Mesostenus paludatus CRESSON, Trans. Amer. Ent. Soc., vol. 4, 1872, p. 162, male.
Type.—No. 1185, Acad. Nat. Sci. Phila.

Discussion based on the unique male type and a female in the National Collection somewhat doubtfully determined by the writer as this species.

Immediately recognizable by its white frontal horn.

Male.—The type differs from the female of *agnatus* in having the head longer behind the eyes with the temples more strongly convex; eyes widely divergent below.

Head and thorax black; frontal horn, anterior and lower posterior orbits, face, mouth parts, scape in front, collar, humeral margins of pronotum, median spot on mesoscutum, scutellum, tegulae, subalar tubercle, and a spot near lower margin of mesopleurum white; flagellum black above, reddish beneath; propodeum ferruginous, stained with black basally and in apical middle, with a white mark on each side of apical face; legs testaceous, front and middle coxae, front trochanters, and joints 2-4 of hind tarsi white; hind femur and tibia apically and basal and apical joints of tarsus black; abdomen ferruginous, tergites beyond fifth black.

The female mentioned above, which is without locality label, is of the same form and structure and abdominal coloration as that of *agnatus* but is somewhat larger (10 mm.) with more white markings. From the type of *paludatus* it differs structurally in the same way as does *agnatus*. In color it differs as follows: face except a small median spot above, black; orbits, interrupted in malar space; anterior margin of pronotum and mesoscutum immaculate; propodeum black, the apical face white with a large median black spot, the edges of the black more or less reddish as is also the apex of the metapleurum; front and middle legs entirely testaceous except for dorsal whitish spots on coxae; abdomen black with only the first, and to a lesser extent the second tergite reddish piceous, second and third narrowly pale reddish at apex.

Genus CRYPTUOPSIS Ashmead

Crypturus ASHMEAD, Proc. U. S. Nat. Mus., vol. 12, 1890, p. 413, (not Gravenhorst).

Cryptuopsis ASHMEAD, Proc. U. S. Nat. Mus., vol. 23, 1900, p. 45. *Genotype*.—*Crypturus texanus* Ashmead.

Head strongly narrowed behind, temples short; occipital carina strongly sinuate and prominent behind cheeks, joining the hypostomal carina far back of mandible; frons unarmed but with a more

CRYPTUOPSIS TEXANUS (Ashmead)

Fig. 6h

Crypturus texanus ASHMEAD, Proc. U. S. Nat. Mus., vol. 12, 1890, p. 413, male.
Type.—Cat. No. 2034, U.S.N.M.

Crypturus dyari ASHMEAD, Can. Ent., vol. 29, 1897, p. 113, female, male.—
DYAR, Journ. N. Y. Ent. Soc., vol. 5, 1897, p. 126. Type.—Cat. No. 3649,
U.S.N.M. (new synonymy).

Crypturopsis texanus ASHMEAD, Proc. U. S. Nat. Mus., vol. 23, 1900, p. 45—
DALLA TORRE, Cat. Hym., 1901-1902, p. 536.

(*Crypturopsis*) *dyari* ASHMEAD, Proc. U. S. Nat. Mus., vol. 23, 1900, p. 45.

Crypturopsis dyari (ASHMEAD) DALLA TORRE, Cat. Hym., 1901-1902, p. 536.

Differs from all other North American species by its obsolete notauli, these being indicated anteriorly by coarser sculpture.

Discussion based on types of both names, allotype and two female paratypes of *dyari*, another male from the same source as the type of *dyari*, and five other specimens of each sex.

The female *dyari* bearing the name label in Ashmead's hand is hereby designated the lectotype of that name.

The color difference between the males noted by Ashmead is more apparent than real, the reddish markings of *texanus* being due to staining. The slight differences in the color of the hind legs are variational.

Female.—Length 7-12 mm.

Eyes nearly parallel within, slightly sinuate opposite antennae, face slightly broadening below; head subtly shagreened; frontal orbits, postvertex, temples and cheeks sparsely punctate; vertex and frons rugose, frons above regularly transversely so, scrobes arcuately rugose; face, clypeus and malar space densely punctate, middle of face somewhat rugulose; malar space subequal to basal width of mandible; antennae two-thirds as long as body, first flagellar joint slightly longer than second, third subequal to second, fourth a little more than half as long as third. Pronotum above punctate, the swollen area nearly smooth, impression and along lateral margin coarsely striate; mesoscutum punctate, the interspaces shagreened, positions of notauli and prescutellar area rugose; scutellum polished with scattered punctures; mesopleurum shining; rugulose above, punctate below, speculum polished, striate anteriorly; sternum densely punctate; sternauli coarsely foveolate; upper division of metapleurum punctate, its lower division and the propodeum irregularly rugose, basal areas partly shagreened; apophyses polished; postnervulus broken distinctly above middle. Abdomen opaque, very finely coriaceous, first tergite polished; sheath nearly as long as abdomen exclusive of first tergite.

Black with whitish markings as follows: Broad orbits interrupted on temples; middle of face (sometimes entire face); convex portion of clypeus; occasionally base of mandible; annulus on flagellum

beginning on fourth joint and centering on about seventh or eighth; anterior margin of pronotum and dorsal swellings; two lines on mesocutum; scutellum and basal carinae; postscutellum; subalar tubercle and a large mark below speculum; tegulae; large spots on upper and lower divisions of metapleurum; apophyses and usually a spot on each side of basal middle of propodeum; first tergite except a spot on disk of postpetiole, and broad apical bands on all other tergites except last; legs testaceous, hind tarsi stramineous, black at apex; wings hyaline, venation blackish, stigma stramineous.

Male.—Except sexually essentially like female, but without antennal annulus, eyes convergent below, front legs paler, and hind legs except coxae darker; hind trochanters more or less, upper surface of femur frequently, tibia except base, which is whitish, and tarsus piceous to black.

The most noteworthy variation is in the comparative width of the female abdomen; in the types of *dyari*, which were parasitic in the short oval cocoons of *Alarodia slossoniae* (Packard), the abdomen is especially broad.

The type of *texanus* is from Texas (Belfrage) and those of *dyari* from Florida, reared by Dr. H. G. Dyar, as was also one other male. The other National Museum specimens are as follows: Florida—Gainesville, September 13, 1923, T. H. Hubbell (one specimen); Miccosuke, April 27, 1924, T. H. Hubbell (one specimen); Biscayne Bay (one specimen); one specimen labelled simply Florida. Louisiana—Crowley, August 29, 1911, E. S. Tucker (one specimen). Alabama—Pysiton, Clay County, H. H. Smith (two specimens). Texas—Plano, October, E. S. Tucker (two specimens); Victoria, April 28, 1904, W. E. Hinds (one specimen).

CRYPTUROSIS AUDAX (Cresson) (new combination)

Fig 2f

Mesostenus audax CRESSON, Can. Ent., vol. 10, 1878, p. 207, female. *Type*.—No. 1172, Acad. Nat. Sci. Phila.

Mesostenus exaptus CRESSON, Can. Ent., vol. 10, 1878, p. 208, female. *Type*.—No. 1176, Acad. Nat. Sci. Phila.

Mesostenidea exapta (Cresson) VIERECK, Hym. Conn. (1916) 1917, p. 329.

Discussion based on types of both names, a specimen in the National collection compared with both types by the writer, and seven other females.

The two types differ apparently only in size and coarseness of sculpture and exhibit minor differences in extent of color. The specimen compared with the types is intermediate in these respects between the two.

Female.—Length 7–14 mm.

Differs from *texanus* essentially as follows. Face slightly narrower than frons, barely widening below, eyes hardly at all sinuate opposite

antennae; frons irregularly rugose above, scrobes with striae radiating from antennal foramina; face less densely punctate, clypeus and malar space sparsely so; antennae about three-fourths as long as body, fourth flagellar joint two-thirds as long as third. Notauli distinct anteriorly; inner margins of lateral lobes polished and almost impunctate; lower division of metapleurum coarsely punctate but not rugose; propodeum reticulate rugose; apophyses compressed; postnervulus broken very nearly at middle.

Head and thorax colored as in *texanus* except that there is a whitish spot on mesosternum along sternaulus, the spots on scutellar carinae are usually and those at base of propodeum apparently always lacking, and the spots covering the apophyses are much larger; abdomen as in *texanus* except first tergite red with apex whitish; black and whitish on second tergite separated by an irregular reddish streak; hind coxa red, whitish below and at base above, tarsus red apically.

The male is unknown, unless, as I suspect, it is *candidus* (Cresson).

The type of *audax* is from Georgia, that of *exaptus* from Massachusetts. The National Museum material is as follows: Lucaston, N. J., October 10, 1902 (one specimen compared with types), Pennsylvania—Carlisle Junction, August 28, 1909, W. S. Fisher; Inglebrook, September 10, 1909, A. B. Champlain. Maryland—Baltimore; Cabin John, September 7, 1917, R. M. Fouts; Plummer Island, October 12, 1906, A. K. Fisher. Virginia—Great Falls, September 12, 1912, A. N. Caudell. Alabama—Pyziton, Clay County, H. H. Smith.

None of the National Museum specimens is quite so large as the type of *audax* nor quite so small as that of *exaptus*, but they form a good variation series between the two.

CRYPTUOPSIS SAUNDERSI (Cresson) (new combination)

Mesostenus saundersi CRESSON, Can. Ent., vol. 10, 1878, p. 208, female. Type.—No. 1187, Acad. Nat. Sci. Phila.

Much like *audax* but head and thorax much less extensively marked with whitish and first tergite entirely and second apically red.

Known only from the unique type, which is from "Canada West."

CRYPTUOPSIS? ARMATUS (Provancher) (new combination)

Mesostenus armatus PROVANCHER, Addit. Faune Ent. Can. Hym., 1889, p. 76, female.

Otaeustes armatus (Provancher) DAVIS, Can. Ent., vol. 27, 1895, p. 288. Type.—Coll. W. H. Harrington.

The transfer of this species to *Cryptoropsis* is on the strength of a note on the type by S. A. Rohwer, which says that it runs in Ashmead's key very satisfactorily to this genus. The species assigned

in the present paper to *Diapetimorpha* also run in Ashmead to *Crypturopsis*, and it may be that *armatus* should be assigned there. Rohwer's notes do not mention the form of the areolet, nor does the original description. The form of the propodeal apophyses appears from the description to be more like that of *Diapetimorpha*. Because of this doubt I have keyed the species out under both genera.

The following is a rearranged translation of Provancher's description with additions from Rohwer's notes:

Female.—Length, 10 mm.

Robust; antennae stout; notauli well defined in anterior fourth; sternauli foveolate; scutellar fovea foveolate, scutellum shining, impunctate; propodeum rugose posteriorly, apophyses thornlike; areolet small, second intercubitus obsolete; abdomen short oval; postpetiole broad; ovipositor shorter than abdomen.

Black with the following white markings: Clypeus, spot on mandible, palpi, annulus beyond middle of antenna, spots on anterior angles of pronotum, tegulae, subalar tubercles, a small spot above middle coxae, scutellum, postscutellum, spots on upper and lower divisions of metapleurum, apophyses, and apical margins of all tergites; first tergite, except apex, and a line on second between the black and white red; antennae, except annulus, black; legs, including coxae and trochanters, red.

Known only from the type, which is from Ottawa, Ontario.

CRYPTUOPSIS CANDIDUS (Cresson)

Mesostenus candidus CRESSON, Can. Ent., vol. 10, 1878, p. 206, male. *Type*.—No. 1173 Acad. Nat. Sci. Phila.

Crypturus albomaculatus ASHMEAD, Proc. U. S. Nat. Mus., vol. 12, 1890, p. 414, male. *Type*.—Cat. No. 2035, U.S.N.M.

(*Crypturopsis albomaculatus* ASHMEAD, Proc. U. S. Nat. Mus., vol. 23, 1900, p. 45.

Endurus albomaculatus (ASHMEAD) DALLA TORRE, Cat. Hym., 1901–1902, p. 528.

Mesostenidea candida (Cresson) VIERECK, Hym. Conn., (1916) 1917, p. 329.

Crypturopsis candidus (Cresson) CUSHMAN, Journ. Wash. Acad. Sci., vol. 15, 1925, p. 390.

Discussion based on type, a specimen compared with the type, the type and paratype of *albomaculatus* and one other specimen.

Known only in the male, unless, as seems likely, it is the male of *audax*.

Differs from the male of *texanus* as follows: Mesoscutum very densely punctate, notauli distinct anteriorly; white of posterior orbits at most narrowly interrupted above; malar space frequently black; a white spot on each side of mesosternum close to sternauli; apophyses somewhat more prominent and less smoothly rounded, the yellow spots extending farther from their bases; all coxae and

hind trochanters black and white; hind tarsus, except base and apex, white.

The type of *candidus* is from New York and those of *albomaculatus* from Michigan. The other two specimens in the National collection are from Malden, Mass., September 9, 1879; and Florida.

Except for slight differences in size and in extent of white markings, all specimens are very much alike.

CRYPTUOPSIS FORTIS (Cresson)

Mesostenus fortis CRESSON, Can. Ent., vol. 10, 1878, p. 206, female. *Type*.—No. 1177, Acad. Nat. Sci. Phila.

Mesostenidea fortis (Cresson) VIERECK, Hym. Conn., (1916) 1917, p. 329.

Cryptuopsis fortis (Cresson) CUSHMAN, Journ. Wash. Acad. Sci., vol. 15, 1925, p. 390.

As suggested by Cresson this may possibly be the female of *candidus*, but the greater extent of white markings in the female is very unusual. Moreover, there is in the National Collection a male which agrees in this respect with *fortis* and is apparently distinct from *candidus* and which I take to be the male of *fortis*.

This male differs from *candidus* as follows: Face distinctly less than half as long as broad, malar space much shorter than the basal width of mandible; diameter of ocelli fully three-fourths as long as basal width of mandible; propleura apically white; mesosternum and hind tarsus entirely white.

The female type has the mesosternal marking reduced to two large spots so shaped that together they form a jew's-harp-shaped mark.

The type from New York and the male described above, which is from Highspire, Pa., July 30, 1910, W. S. Fisher, appear to be the only known specimens of this species.

CRYPTUOPSIS ABDOMINALIS, new species

Fig. 3a

Very distinct from all the other species in its largely red abdomen.

Female.—Length, 12 mm.; antennae, 9 mm.; ovipositor, 3 mm.

In stature and structure nearly identical with *audax* but malar space fully as long as basal width of mandible and sculpture of head and thorax somewhat coarser and denser, with scrobes arcuately striate and metapleurum punctuate-rugose; white markings as in *audax* but somewhat less extensive on thorax; white orbits rarely interrupted behind top of eyes; antennal annulus incomplete below; scutellar carinae always white marked; coxae black and white, hind coxa more or less red especially at apex on inner side; front and middle trochanters white; legs otherwise testaceous, the tarsi slightly paler; abdomen ferruginous, base of first and apices of first and second tergites indefinitely yellowish.

Type locality.—Put in Bay, Ohio.

Type.—Cat. No. 40586, U.S.N.M.

Described from eight females, six collected during June and July, 1924, at the type locality and received from Prof. C. H. Kennedy, Ohio State University; one from New Haven, Conn., June 17, 1911, A. B. Champlain; and one from Chevy Chase, Md., D. G. Fairchild.

Genus DIAPETIMORPHA Viereck

Diapetimorpha VIERECK, Proc. U. S. Nat. Mus., vol. 44, 1913, p. 565. *Genotype*.—(*Cryptus armatus* Ashmead)=*Diapetimorpha introitus* (Cresson).

Very closely related to *Crypturopsis* Ashmead but at once distinguishable by the form of the areolet, which appears to be the only constant difference. The flagellar joints are more slender but bear the same relation to each other; the scutellum is usually somewhat more convex with the lateral carinae stronger; the apical carina of the propodeum is usually more distinct, especially in the male; the apophyses in the female are more distinctly compressed and usually distinctly carinate, in the male they are not developed; the occipital carina is not or only weakly sinuate behind the cheeks; and the nervellus is broken at or near the middle with its upper abscissa usually nearly or quite perpendicular to the cubitella.

Apparently bears very little relationship to *Diapetus* Cameron, with which Viereck originally compared it, and which appears, from the description, to be similar to *Earrana* Cameron.

The species here assigned to this genus form a rather heterogeneous group, which should perhaps be separated into several genera.

The seven North American species known to me may be distinguished by the following key:

Crypturopsis? *armatus* (Provancher), which perhaps belongs to this genus, is included.

1. First tergite red, others black and white.

Crypturopsis? *armatus* (Provancher).

- Abdomen otherwise colored..... 2
2. Nervellus broken far below middle and strongly inclivous; apical carina in female entirely wanting between apophyses; abdomen black and white, tergites 3 and 4 in male sometimes pale reddish..... 3
- Nervellus broken at or not far below middle, reclivous, upper abscissa perpendicular to cubitella; apical carina in female more or less distinctly indicated between apophyses; abdomen red, rarely in male black and yellow..... 4
3. Mesoscutum with two small spots or lines on disk; petiole basally white; hind coxa in female red and white..... orba (Say).
- Mesoscutum with a single median spot; petiole basally black; hind coxa in female black and white..... cinctiventris, new name.
4. Clypeus weakly convex, without a distinct reflexed margin; mesoscutum with two small spots or lines on disk (sometimes indistinct); head in both sexes black and white, the pale orbits not interrupted at top of eyes; male antenna without pale annulus..... 5

- Clypeus rather strongly convex, with a distinct reflexed margin; mesoscutum immaculate or with a single median spot; head in female unicolorous, in male black and yellow, pale orbits interrupted at top of eye; male antenna with a pale annulus..... 7
5. Thorax not at all red..... *rufigaster*, new species.
Thorax partly or entirely red..... 6
6. Pronotum and mesoscutum black and white..... *confederata*, new species.
Pronotum and mesoscutum largely red..... *alabama*, new species.
7. Thorax in female red, in male red and yellow; a small species.
acadia, new species.
Thorax in female black, in male black and yellow; a large species.
introita (Cresson).

DIAPETIMORPHA ORBA (Say) (new combination)

Fig. 6f

Cryptus orbis SAY, Boston Journ. Nat. Hist., vol. 1, 1835, p. 231 (LeConte ed., vol. 2, p. 688). *Type*.—Lost; neotype in U.S.N.M.

Hemiteles orbis (Say) WALSH, Can. Ent., vol. 2, 1869, p. 9.—CRESSON, Synop. Hym. No. Amer., 1887, p. 199.

Mesostenus diligens CRESSON, Can. Ent., vol. 10, 1878, p. 207, female. *Type*.—No. 1175, Acad. Nat. Sci. Phila.

Lyneon annulicornis ASHMEAD, Ins. Life, vol. 7, 1894, p. 243, female. *Type*.—Cat. No. 1462, U.S.N.M.

Crypturopsis annulicornis (Ashmead) CUSHMAN, Proc. U. S. Nat. Mus., vol. 55, 1919, p. 521. (Possibly synonymous with *diligens*.)

Crypturopsis orbis (Say) CUSHMAN and GAHAN, Proc. Ent. Soc. Wash., vol. 23, 1921, p. 162.

Has very much the appearance of a species of *Crypturopsis* but with areolet distinctly pentagonal.

Discussion based on neotype of *orbis*, type and homotype (Viereck) of *diligens*, type of *annulicornis*, and 13 other females and 6 other males, all except the type of *diligens* in the United States National Museum.

Female.—Length, 5–9 mm.

Head very finely coriaceous, temples and cheeks subpolished, frons and vertex medially rugulose; face sparsely punctate and somewhat rugulose just below antennae, with a shallow impression on each side of middle just above clypeus. Temples very narrow and nearly flat; cheeks swollen; occipital carina slightly sinuate below; clypeus strongly convex with a distinct reflexed margin; malar space two-thirds basal width of mandible; upper tooth of mandible larger and longer than lower; flagellum slender, neither thickened nor flattened below toward apex, joint 1 about six times as long as thick, 2 and 3 somewhat shorter and subequal, 4 a little more than half as long as 3, others successively shorter. Thorax shining; pronotal impression striate; mesoscutum opaque coriaceous, middle of disk irregularly longitudinally striate, prescutum sparsely punctate, notauli foveolate; scutellum polished, not margined; mesopleurum partly and all

of metapleurum more or less distinctly obliquely striate, propodeum reticulate-rugose, striately so in middle posteriorly, apophyses thick, subtuberculate, apical carina otherwise entirely lacking, spiracles small oval; areolet somewhat shorter than high; nervulus antefurcal; postnervulus broken above middle; nervellus distinctly inclivous, broken far below middle; legs slender, front tibia subinflated. Abdomen broadly fusiform, finely opaque coriaceous, first tergite polished, petiole broad, depressed, second tergite densely finely punctate; sheath less than half as long as abdomen, ovipositor stout, compressed, apex subsagittate.

Black with very profuse white markings as follows: Head (except occiput, a median band on vertex and frons, apices of mandibles and clypeus, and sometimes the clypeal suture); antennal annulus centering on flagellar joint 7; propleura below; broad humeral margins and collar of pronotum; two lines on mesoscutum; scutellum and its basal carinae; postscutellum; tegulae; mesopleurum and sternum except along sutures and impressions; both upper and lower divisions of metapleurum; a broad band on each side of propodeum from basal carina to apex and enclosing the apophyses; base and apex of first tergite and broad apices of others; wings hyaline; legs testaceous, front coxae and trochanters, middle coxae, dorsal spot on hind coxa, and hind tarsus except blackish apical joint whitish.

Male.—More slender than female, subpolished, the sculpture much weaker throughout; temples broader and more strongly convex; apical carina more or less distinct throughout and without apophyses; abdomen very narrowly fusiform.

Clypeus entirely white; antennae without annulus; hind coxa white with a black stripe above; trochanter largely black; tibia fuscous with a paler dorsal streak, which sometimes encircles the tibia; tarsus black at extreme base and apex, otherwise white; apex of third and entire fourth tergite reddish.

The normal host for this species is apparently the egg-sacs of spiders, many of the specimens examined having been reared from the egg-sacs of Drassidae; but there are two specimens said to have been reared from lepidoptera, one from *Laspeyresia molesta* Busck and one from a case-bearer on smartweed.

The type of *orbis* was from Indiana; that of *diligens* from Illinois; and that of *annulicornis* from Mississippi. The other specimens studied are as follows: Four females and two males, including the neotype of *orbis* and the homotype of *diligens*, Twining, Md., April, 1898, ex-egg-sacs of (*Prosthesima*)=*Zelotes* sp., A. Busck; two females and one male from the same or a similar host, without locality label but reared by Theodore Pergande probably from near Washington; one female, Glen Echo, Md., July, 1923, R. M. Fouts;

one male, Washington, D. C., 1917, parasite of *Laspeyresia molesta*, Quaintance No. 1345, E. R. Selkregg; one female, Chain Bridge, Va., June 14, S. A. Rohwer; one female, Dead Run, Va., September 29, 1912, H. L. Viereck; one male, Virginia, July 16, 1880, T. Pergande; one female, Pyziton, Ala., H. H. Smith; one female, St. Catherine's Island, Ga.; one male, Forbing, La., March 24, 1908, R. A. Cushman; one female, Dallas, Tex., April 17, 1906, W. W. Yothers; one female, Victoria, Tex., April 22, 1907, R. A. Cushman; one male, St. Louis, Mo., ex-case-bearer on smartweed, June 23, 1876 (Riley collection); and one female without data.

DIAPETIMORPHA CINCTIVENTRIS, new name

Mesostenus laticinotus CRESSON, Can. Ent., vol. 10, 1878, p. 208, female (not Walker). Type.—No. 1181, Acad. Nat. Sci. Phila.

Mesostenus cressonii DALLA TORRE, Cat. Hym., 1901, p. 539 (not Ashmead).

Ashmead used the combination *Mesostenus cressonii* in 1900 for the preoccupied *Mesostenus insularis* (Cresson). Cresson never described a Mesostenine under the name *insularis*, and the only possible inference is that Ashmead misread *Mesoleptus insularis* Cresson as *Mesostenus insularis*. *Mesoleptus insularis* Cresson is certainly not a Mesostenine, but Ashmead's use of the combination *Mesostenus cressonii* antedates that of Dalla Torre and renders a new name for the present species necessary.

Discussion based on type and a specimen compared with the type by Cushman.

Female.—Length, 9 mm.

Distinct from *orba*, which it superficially resembles rather closely, by single median mesothoracic spot and by the following characters:

Face densely punctate, cheeks and temples sparsely so; teeth of mandible equal; flagellum distinctly thickened and flattened below beyond middle and tapering toward apex, the basal joints hardly as slender; mesoscutum densely, finely punctate, opaque, mesopleurum densely, finely punctate, striate only in impressions; metapleurum more coarsely punctate, propodeum finely reticulate rugose without any striation apically, apophyses small, acute; front tibia not at all inflated. Abdomen narrower, especially the first tergite, the petiole slender cylindrical; second tergite impunctate.

Clypeus entirely white, mesoscutum with a single median spot, first tergite white only at apex; hind coxa white, black below at base and at apex above; joints 1 and 4 of hind tarsus red, 2 and 3 white, 5 black.

The type is from Louisiana and the United States National Museum specimen from Easley, S. C., J. O. Pepper, collector.

DIAPETIMORPHA RUFIGASTER, new species

Female.—Length, 8 mm.

Temples very strongly narrowed and nearly flat, subpolished; cheeks subpolished convex, not swollen, lower end of occipital carina not at all sinuate or prominent; frons finely coriaceous; face very slightly narrower than frons, densely finely punctate, almost flat without distinct impressions; clypeus not strongly convex, without a reflexed margin, apex rounded; malar space two-thirds as long as basal width of mandible, teeth of mandible subequal; antennae as long as body; flagellum very slender, slightly thickened in middle, joint 1 longest, 2 slightly longer than 3, 4 two-thirds as long as 3, others successively gradually shorter. Thorax anteriorly and dorsally shining, laterally and posteriorly opaque; pronotum striate in impressions, polished along margins; mesoscutum with fine, separated punctures, notauli fine anteriorly, soon becoming obsolete; scutellum polished, margined laterally in basal half; mesopleurum and sternum densely finely punctate, metapleurum somewhat more coarsely so, mesopleurum somewhat striate above, speculum polished; propodeum with basal carina strong, apical weak but distinct, apophyses long, compressed, basal areas finely rugulose, middle areas reticulate rugose, apical areas transversely rugulose, spiracles small oval; cubitus obsolete beyond second recurrent; nervulus interstitial; postnervulus broken above middle; nervellus reclivous, broken at middle, its upper abscissa perpendicular to cubitella; legs slender, front tibia not at all inflated. Abdomen only a little longer than head and thorax, subclavate; first tergite slender, polished, postpetiole gradually widening toward apex; second tergite twice as long as broad at base and nearly twice as wide at apex, this and following tergites finely coriaceous; sheath as long as abdomen exclusive of first tergite; ovipositor slender, compressed, sagittate at apex.

Head and thorax black and yellowish white, legs and abdomen largely red; orbits except narrow interruption on malar space, middle of face, clypeus largely, incomplete annulus on flagellum centering on seventh joint, humeral margin and collar of pronotum, two lines on middle of mesoscutum and a small spot near each lateral margin, tegulae, subalar tubercle, a spot above speculum, a large spot covering lower part of mesopleurum and side of sternum and partially divided by sternaulus, scutellum, postscutellum, both upper and lower divisions of metapleurum, a small spot on each side of propodeum near base and a broad stripe on each side from basal carina to apex enclosing the apophyses, front coxae and trochanters, middle coxae, apex of first tergite and of seventh tergite yellowish white;

apices of second and third tergites indefinitely pale; antennae black, piceous at base; wings hyaline, veins brown, stigma stramineous.

Type-locality.—Potomac Creek, Va.

Type.—Cat. No. 40587, U.S.N.M.

One specimen, taken May 22, 1896.

DIAPETIMORPHA CONFEDERATA, new species

Related to *rufigaster*, from the above description of which it differs as follows:

Female.—Length, 10 mm.

Joint 4 of flagellum little more than half as long as 3; thorax opaque throughout; mesoscutum finely coriaceous with some striations along notauli and in posterior middle; scutellum margined nearly to apex; mesopleurum finely rugulose-punctate, metapleurum more coarsely so; venation as in *rufigaster* except that nervulus is slightly antefurcal and nervellus broken below middle; abdomen fusiform, postpetiole and base of second tergite broader, the latter less than twice as long as broad at base; ovipositor stout.

Head and thorax anteriorly black and white, thorax below and posteriorly and propodeum, abdomen and legs red; head as in *rufigaster* except that face is not medially white; pronotum, mesoscutum, scutellum, and postscutellum as in *rufigaster* except lateral spots on mesoscutum are lacking, prepectus black; mesopleurum, mesoscutum, upper division of metapleurum, and apophyses paler reddish or yellowish; abdomen as in *rufigaster* with apical tergites somewhat darker; legs entirely red, the front and middle coxae slightly paler; front wing with a pale cloud or band below stigma.

Type-locality.—Dallas, Tex.

Type.—Cat. No. 40588, U.S.N.M.

Two females, the type captured October 20, 1906, by W. D. Pierce, and the paratype, in which the right hind leg and both antennae are missing, from Biscayne Bay, Fla., where it was probably taken by Annie T. Slosson.

The red of the paratype is much darker than that of the type.

DIAPETIMORPHA ALABAMA, new species

In structure and sculpture very much like *confederata*, but thorax without black except along sutures of prothorax and mesonotum; wings immaculate. May be a pale variety of *confederata*.

Female.—Length, 6–8 mm.; type, 8 mm.

Head and antennae black and white, the pattern as in *rufigaster*, scape pale reddish; thorax with same yellow pattern as *confederata*; legs and abdomen as in *rufigaster*; wings immaculate.

Male.—Smaller and more slender than female with sculpture largely erased; propodeum without apophyses, but apical carina

very distinct; head white with only occiput and middle of vertex and frons and teeth of mandibles black; scape white, flagellum pale reddish, fuscous above toward base; thorax pale testaceous with the white pattern less distinct than in female, some of the markings usually absent; legs paler with most of front and middle legs and hind tarsus stramineous; tergites 2 and 3 blackish at base.

Type-locality.—Pyziton, Clay County, Ala.

Type.—Cat. No. 40589, U.S.N.M.

Five females and ten males, all but three collected by H. H. Smith at Pyziton, Coleta, and Langdale, Ala.; one male from Cabin John, Md., August 6, 1917, R. M. Fouts; one male, Chevy Chase, Md., H. H. Smith; one female, Rockaway Beach, Long Island, F. H. Chittenden.

The New York specimen has the black of the head and thorax more extensive, the malar space and a line on each side of middle of face blackish red.

DIAPETIMORPHA ACADIA, new species

In spite of its small size and red color this is of all the species most closely related to the genotype in general form and structure and also in the strong color antigeny between the sexes.

Female.—Length, 7–8 mm.; type, 7.5 mm.

Head very finely and weakly punctuate coriaceous, face densely finely punctate opaque; frons with a median carina; temples convexly sloping, not nearly perpendicular to body axis; cheeks convex, occipital carina not sinuate nor prominent below; eyes very slightly convergent below, not at all sinuate within; malar space nearly as long as basal width of mandible; teeth of mandibles subequal; antennae nearly as long as body, first three joints of flagellum long and slender, successively shorter, fourth a little more than half as long as third, others very gradually shorter. Thorax dorsally and ventrally shining, finely and rather sparsely punctate, laterally confluent punctate; pronotum striate in impression; notauli shortly distinct; scutellum margined only at base, subpolished; propodeum bicarinate, the apophyses not high, basal areas shining, sparsely punctate, middle and apical areas reticulate rugose, spiracles small oval; areolet fully as long as high; cubitus obsolete beyond recurrent; nervulus interstitial or nearly; nervellus reclivous, broken at about the middle; legs slender, front tibia not inflated. Abdomen fusiform, tergites 2 to 6 very broad and strongly folded, their spiracles very far from lateral margin; first tergite polished, postpetiole rather broad but merging gradually into the petiole; tergites 2–6 opaque coriaceous, apical tergites polished; sheath as long as abdomen exclusive of first tergite; ovipositor rather stout, compressed, sagittate at apex.

Ferruginous; mouthparts, scutellum, upper division of metapleurum and region around apophyses more or less distinctly paler; antennae with an incomplete white annulus centering on seventh flagellar joint, red basad of annulus, black beyond; front wing with an infumate band below stigma; legs testaceous, front ones paler; apex of postpetiole indefinitely paler; seventh tergite white above.

Male.—Sculpture less dense throughout; apical carina entirely without apophyses; abdomen narrow, spiracles close to margins of tergites; head black and white, orbits except interruption at vertex, face, clypeus, mouthparts and scape beneath white; antennae black with a whitish annulus centering on flagellar joint 11, joints gradually shorter from base, the fourth not abruptly shorter; thorax, especially laterally, and legs paler; wings hyaline; abdomen, except the stramineous petiole, ferruginous.

Type-locality.—Louisiana.

Type.—Cat. No 40590, U.S.N.M.

Nine females and eight males as follows: Four females and three males, including the type and allotype, from Louisiana (C. F. Baker collection); one female, Opelousas, La., G. R. Pilate; one female, Plano, Tex., October, 1907, E. S. Tucker; one male, Paris, Tex.; one male, Lolita, Tex., J. D. Mitchell; one female, Victoria, Tex., April 11, 1911, J. D. Mitchell; one female, San Antonio, Tex., May 4, 1905, W. D. Pierce (Hunter No. 112); one male, Alabama (C. F. Baker collection); one male, Lexington, Ky.; one female, Raleigh, N. C., April 10, 1927, C. S. Brimley; one male, Washington, D. C., July 14, 1915, W. A. Donnell.

DIAPETIMORPHA INTROITA (Cresson) (new combination)

Figs. 3f, 6g

Mesostenus introitus CRESSON, Trans. Amer. Ent. Soc., vol. 4, 1872, p. 162, male.

Type.—Cat. No. 1577, U.S.N.M.

Mesostenus dejectus CRESSON, Trans. Amer. Ent. Soc., vol. 4, 1872, p. 163, female. *Type*.—No. 1174, Acad. Nat. Sci. Phila. (new synonymy).

Cryptus armatus ASHMEAD, Proc. U. S. Nat. Mus., vol. 12, 1890, p. 411, female, (not Lucas). *Type*.—Cat. No. 2026, U.S.N.M. (new synonymy).

Cryptus ashmeadii DALLA TORRE, Cat. Hym., 1901-1902, p. 562 (new synonymy).

Diapetimorpha armatus (Ashmead) VIERECK, Proc. U. S. Nat. Mus., vol. 44, 1913, p. 565.

In spite of the marked color antigeny between the sexes I have no doubt of the correctness of the above synonymy.

Discussion based on the types of all names, a homotype (R. A. Cushman) of *dejectus* and three additional specimens of each sex
Female.—Length, 10-12 mm.

Head behind eyes shining and sparsely punctate, otherwise minutely densely punctate opaque; temples convexly sloping, cheeks

convex, occipital carina not sinuate nor prominent below; eyes slightly convergent below; clypeus convex with a narrow reflexed margin; malar space nearly as long as basal width of mandible; mandibles with teeth subequal; antennae considerably shorter than body, first three flagellar joints elongate, first longest, 2 and 3 subequal, 4 a little more than half as long as 3. Thorax opaque, finely confluent punctate laterally, less densely so dorsally and ventrally; notauli distinct about half way; pronotum in impressions and mesopleurum above speculum striate; apophyses strong, apical carina obsolete; propodeum punctate before basal carina, reticulate rugose behind, spiracle short oval; areolet longer than high, recurrent far before middle, cubitus obsolete beyond recurrent; nervulus interstitial or nearly; postnervulus broken at or below middle; nervellus reclivous, upper abscissa perpendicular to cubitella, broken below middle; legs slender, front tibia not inflated. Abdomen except first segment opaque coriaceous; tergites 2-6 very broad and strongly folded with spiracles far from lateral margins; sheath barely half as long as abdomen; ovipositor stout, compressed, subsagittate at apex.

Head and thorax black, clypeus, mandibles, collar, and scutellum more or less reddish, apophyses whitish; antennae piceous at base with an incomplete white annulus centering on flagellar joint 7. black beyond; wings uniformly infumate; legs and abdomen ferruginous, front legs paler, hind tarsus fuscous.

Male.—More sparsely punctate and shining; apical carino of propodeum more distinct but apophyses hardly developed; abdomen narrow with spiracles close to margin of tergites.

Black with yellow markings as follows: Orbits except narrow interruptions above and below eyes; face, clypeus and mouth parts; incomplete annulus centering on flagellar joint 11; collar, tergulae median spot on mesosternum, scutellum, postscutellum, four small or two large spots on mesoscutum, sometimes a small spot on mesopleurum below, upper division of metapleurum, propodeum beyond basal carina and usually more or less before; apices of all tergites and base of first; wings hyaline; legs testaceous, front legs largely and middle coxae yellow; hind coxae above yellow, trochanter at base, tibia at apex, and basal and apical joints of tarsus black, middle three joints of tarsus yellow.

The types of all three names are from Texas as are also two of the additional females and one of the males. The other female and two males are from Louisiana, one of each sex having been collected at Opelousas by G. R. Pilate.

Genus POLYAENUS Cresson

Polyaenus CRESSON, Proc. Acad. Nat. Sci. Phila., 1873, p. 570. *Genotype*.—*Polyaenus ectypus* Cresson.

A tropical genus represented in our fauna by a single species largely southern in its range but extending on the Atlantic seaboard as far north as Long Island and southern Connecticut.

Closely related to *Crypturopsis* Ashmead, from which it is distinguishable by the bicornute frons, the small convex scutellum, the longer and more spinelike apophyses, siltlike propodeal spiracles, and the closed areolet, which is, however, of the same form as that of *Crypturopsis*, antefurcal nervulus, the usually longer sheath, and the form of the ovipositor, which is stout, strongly compressed, deeper toward apex than at base and more swordlike than sagittate at apex.

The two frontal horns are sometimes placed on a common base so that they form really a single double pointed horn; and the areolet varies considerably in relative length and breadth with the recurrent interstitial or more or less antefurcal.

POLYAENUS SPINARIUS (Brullé)

Figs. 1*d*, 3*k*, 6*i*

Mesostenus spinarius BRULLÉ, Hist. Nat. Ins. Hym., vol. 4, 1846, p. 227, female.

Mesostenus albopictus CRESSON, Proc. Ent. Soc. Phila., vol. 3, 1864, p. 312 (not Smith), male.

Mesostenus delawarensis DALLA TORRE, Cat. Hym., 1901–1902, p. 540.

Polyaenus spinarius SCHMIEDEKNECHT, Gen. Ins., fasc. 75, 1908, p. 68.

Mesostenus spinarius VIERECK in Smith: Insects of N. J., 1910, p. 630.

Mesostenidea (*Polyaenus*) *spinaria* VIERECK, Hym. Conn. (1916), 1917, p. 329.

Polyaenus spinarius CUSHMAN, Journ. Wash. Acad. Sci., vol. 15, 1925, p. 391.

Discussion based on Brullé's description, type, and homotype (Cushman) of *albopictus*, and 9 females and 12 other males in the National collection.

Female.—Length, 11–15 mm.

Head subpolished behind and along anterior orbits; frons medially obliquely striate, with a median carina, frontal horns small; face with a median rounded and sparsely punctate area, the impression on each side rugose; temples sharply sloping, nearly flat; cheeks broader than temples, convex, lower end of occipital carina sinuate and slightly prominent; eyes subparallel within; malar space three-fourths as long as basal width of mandible; antennae about three-fourths as long as body; flagellar joint 1 distinctly longer than 2, which is slightly longer than 3; 4 two-thirds as long as 3. Thorax shining, coarsely sculptured; pronotum rugose except along anterior margin, dorsal lateral margins swollen, epomia reaching nearly to dorsal margin; mesoscutum coarsely punctate, notauli complete, deep,

foveolate; scutellum sparsely punctate; mesopleurum striate above, punctate below, speculum polished, sternum punctate, sternauli foveolate; metapleurum punctate, rugosely so below; propodeum basad of carina polished and sparsely punctate, middle area punctate medially, reticulate rugose laterally, apical slope transversely rugose with a narrow median polished area, apophyses long; areolet longer than high, wider at apex than at base, recurrent interstitial or nearly; legs slender, front tibia slightly swollen; abdomen finely coriaceous, first tergite polished, with a prominent flange on lower margin at base of postpetiole; sheath as long as abdomen exclusive of first tergite.

Black with whitish markings as follows: Orbits with narrow interruptions behind top of eye and sometimes in malar space, middle of face and clypeus, mandibles basally, annulus centering about on the eighth flagellar joint, anterior and dorso-lateral margins of pronotum, rounded median spot on mesoscutum sometimes flanked on either side by a narrow line; scutellar carinae and scutellum except in basal middle, postscutellum, and apical margins of their lateral areas; subalar tubercle, a large oblique mark on mesopleurum a branch of which runs forward on sternum; upper division of metapleurum and upper part of lower division; a broad mark on each side of apical slope of propodeum including the apophyses and extending forward narrowly to the basal carina; apices of all tergites except last; petiole reddish; wings hyaline, veins black, stigma brown; legs testaceous, front coxa and trochanter, middle ones largely, dorsal spot on hind coxa, and hind tarsus except apex yellow; hind tibia yellow, testaceous at apex.

Male.—Like female but malar space a little narrower; flagellar joints gradually successively shorter; apical carina of propodeum more or less distinct throughout, apophyses short, space covered by anterior extension of yellow spots in the form of strong welts; first tergite without prominent flange below; antennal annulus centering about on joint 13 of flagellum; petiole and apical tergites largely yellow; front and middle legs yellow, only the femora red, the coxae sometimes black below at base; hind coxa black with a yellow streak above and more or less piceous below, trochanter and base of femur piceous red; femur black with apex narrowly pale; tibia yellow, extreme base red, apex broadly black; tarsus yellow.

The type was from Carolina and that of *albopictus* from Delaware, and the species has been recorded by Viereck from as far north as Stonington, Conn. The specimens in the United States National Museum are from Texas (Belfrage, Fouts); San Antonio, Tex., F. C. Pratt; Plano, Tex., E. S. Tucker; Calvert, Tex., F. C. Bishopp; Pyziton, Ala., H. H. Smith; Paradise Key, Fla., C. A. Mozier; Falls Church, Va., S. A. Rohwer; Difficult Run, Va., W. L. McAtee;

District of Columbia; Beltsville, Md., W. L. McAtee; Chesapeake Beach, Md., A. Busck; Heckton Mills, Pa., W. S. Fisher and A. B. Chamberlain; Ocean Grove, N. J.; and Long Island, N. Y.

Genus MESOSTENUS Gravenhorst

Mesostenus GRAVENHORST, Ichn. Eur., vol. 2, 1829, p. 750. *Genotype*.—*Mesostenus transfuga* Gravenhorst.

Stenaraeus THOMSON, Opusc. Ent., fasc., 21, 1896, p. 2378. *Genotype*.—*Mesostenus transfuga* Gravenhorst.

A group of slender, rather small species with clypeus convex with a narrow reflexed margin; eyes parallel within and not sinuate; malar space nearly or quite as long as basal width of mandible; occipital carina neither sinuate nor prominent below; frons transversely swollen above with a median carina but without horns, the carina sometimes, especially in males, simulating a horn but this high up on frons; antennae slender; thorax elongate; scutellum moderately convex, immargined; notauli distinct and usually completely defined; propodeum with both basal and apical carinae, the latter usually obliterated medially, without distinct apophyses, spiracles small oval; areolet long and narrow with recurrent shortly antefurcal, rarely quadrate with recurrent interstitial, closed at apex; nervulus interstitial or antefurcal; postnervulus broken at or below the middle; nervellus broken far below middle, its upper abscissa perpendicular to cubitella; legs slender, front tibia not at all inflated; hind trochanter with basal joint fully as long as apical; abdomen narrow, petiole gradually merging into postpetiole, suture between tergite and sternite frequently obsolete, sternite usually extending beyond spiracles; ovipositor sheath at most as long as abdomen.

The five known North American species may be separated as follows:

1. Pleura and propodeum red----- 2
Pleura and propodeum black or black and yellow----- 3
2. Apical carina in female very strong on angles; in male strong throughout, the propodeum roughly reticulate-rugose behind; ovipositor in profile broad at apex; hind tarsus in female paler than tibia, in male white except at extreme base and apex; antenna in male always with a distinct white annulus----- thoracicus Cresson.
Apical carina of propodeum in female not especially strong on angles, in male frequently interrupted in middle and not especially strong, the propodeum not reticulate-rugose behind; ovipositor in profile very narrow at apex; hind tarsus in female not paler than tibia, in male rarely with more than three middle joints white, frequently all black; antennae in male rarely with distinct white annulus----- gracilis Cresson.
3. Thorax profusely marked with yellow----- leucopus Ashmead.
Thorax not profusely marked with yellow----- 4
4. Temples narrowed; abdomen not black at apex----- promptus Cresson.
Temples as broad as eyes or nearly; abdomen broadly black at apex.
melanurus, new species.

MESOSTENUS THORACICUS Cresson

Fig. 3j, 4b, 6f

Mesostenus thoracicus CRESSON, Proc. Ent. Soc. Phila., vol. 3, 1864, p. 314, female, male.—PROVANCHER, Nat. Can., vol. 7, 1875, p. 266; Nat. Can., vol. 11, 1879, p. 113, fig. 2h; Faune Ent. Can. Hym., 1883, p. 346, fig. 35h.—VIERECK, Smith, Ins. of N. J., 1910, p. 630.

Mesostenus erythrogaster ASHMEAD, Proc. U. S. Nat. Mus., vol. 12, 1890, p. 406, male. Type.—Cat. No. 2017, U.S.N.M. (new synonymy).

Mesostenidea (Mesostenidea) thoracica (Cresson) VIERECK, Hym. Conn. (1916), 1917, p. 329.

Within its range the most abundant Mesostenine.

Discussion based on type and homotype (Cushman), the type of *erythrogaster* and many other specimens in the National Collection.

Female.—Length, 8–13 mm.

Slender; temples strongly, obliquely narrowed, nearly flat, polished and sparsely punctate; vertex and frons medially rugulose; eyes parallel, practically straight within; face medially somewhat elevated and densely punctate, orbits coriaceous and sparsely punctate; clypeus strongly convex, with a narrow reflexed margin, shining and sparsely punctate; malar space two-thirds basal width of mandible; mandible stout, teeth subequal; basal joints of flagellum slender, successively slightly shorter, fourth three-fourths as long as third, others successively gradually shorter. Thorax nearly twice as long as deep and distinctly deeper than broad, densely punctate with some striation in pronotal and mesopleural impressions, and scutellum polished and impunctate; notauli finely foveolate, meeting in a median impression; propodeum more or less rugose on posterior face, apical carina broadly interrupted medially, high on angles. Abdomen less than a half longer than head and thorax, finely, coriaceous, postpetiole polished with scattered punctures, suture between tergite and sternite obsolete; second tergite much longer than broad at base rather densely punctate, third more finely and sparsely punctate; sheath nearly as long as abdomen; ovipositor in profile stout, deeper at apex than at base.

Head black with orbits (usually interrupted behind top of eye), face medially (sometimes entirely), clypeus at base, mandibles partly, and an annulus centering on flagellar joint 8 whitish. Prothorax and dorsum of mesothorax and metathorax and sometimes the anterior portion of mesopleurum, sternum and propodeum black with whitish markings as follows: Collar and humeral margin of pronotum, tegulae, subalar tubercles, median spot on mesoscutum, scutellum laterally and apically and its basal carinae, and postscutellum; thorax and propodeum otherwise ferruginous with upper part of prepectus and apical slope of propodeum sometimes paler; legs testaceous, front coxa and trochanter, spot on upper side of middle coxa, and hind

tarsi stramineous; wings hyaline, veins brown, stigma paler. Abdomen ferruginous, apical tergites sometimes blackish.

Male.—Head thicker, temples less strongly sloping; antennae nearly as long as body, tapering toward apex; propodeum more coarsely rugose, apical carina complete and strong throughout, not more so at angles; abdomen very slender, second tergite three or more times as long as broad at base.

Entire face and clypeus, mandibles except teeth, scape below white; antennal annulus centering on flagellar joint 13, lower part of propleura, mesosternum, more or less of lower part of mesopleurum, a sutural spot below hind wing, and apex of metapleurum more or less distinctly white; front and middle coxae and trochanters largely or entirely and hind tarsus entirely white, hind coxa more or less white below, hind tibia fuscous to black at base and apex, as is rarely also base of basitarsus.

Distributed throughout southeastern Canada and the eastern half of the United States.

The type is from Delaware and that of *erythrogaster* from Wisconsin. The specimens in the national collection are as follows: Canada—(C. F. Baker collection), two females. Massachusetts—(Baker collection), one male. Connecticut—East River, ex *Acrobasis* on hickory, C. R. Ely, one female, one male; Lyme, June 16, 1918, W. Middleton, one female. New York—one female; Ithaca, F. H. Chittenden, one female, one male; Oswego, June 1, 1896, one male. Pennsylvania—West Fairview, July 31, 1909, and July 22, 1911, W. S. Fisher, two females; Rockville, May 15, 1910, W. S. Fisher, one female; Camphill, August 13, 1910, W. S. Fisher, one female; Heckton Mills, June 22, 1910, W. S. Fisher, one female; Harrisburg, May 7, 1910, W. S. Fisher, one female; North Cumberland, May 30, 1908, P. R. Myers, one female; Inglenook, June and September, W. S. Fisher, three females; June 20, 1909, P. R. Myers, one female; Highspire, W. S. Fisher, two females. Ohio—Wooster, October 15, 1896, one female; Bono, November 20, 1924, ex *Pyrausta futilalis*, C. R. Neiswander, one male. Maryland—College Park, October 8, 1924, R. M. Fouts, three females; Beltsville, May 24, 1917, W. L. McAtee, one female; Glen Echo, R. M. Fouts, one female, three males; Cabin John, R. M. Fouts, one female; Plummer Island, one male; W. Middleton, one female. District of Columbia—three females, one male. Virginia, one female; Chain Bridge, October 2, 1921, J. R. Malloch, one female; Pimmit Run, October 1, 1919, R. A. Cushman, one female; Difficult Run, October 28, 1917, W. L. McAtee, one female; Great Falls, R. P. Currie, S. A. Rohwer, H. L. Viereck, three females; Falls Church, September 9, 1912, C. T. Greene, one female; July 8, 1913, W. Middleton, one female; Hern-

don, August 21–28, 1912, ex *Phlyctaenia extricalis*, J. F. Strauss, four females, four males. Alabama—Pyziton, one female, one male, Langdale, one male, H. H. Smith. Louisiana—one female (Baker collection); Lake Charles, November 13, J. C. Crawford. Missouri—Kirkwood, ex *Nephopteryx pergratiella*, November 11, 1882, Mary E. Murtfeldt, one female. Arkansas—Bentonville, ex *Mineola*, June 21, Quaintance No. 20733, one male; July 18, one male, D. Isely. Texas—Dallas, May 23, 1906, F. C. Bishopp, one male. Kansas—Onaga, Crevecoeur, one male; Lawrence, August 20, 1896. Hugo Kahl. Colorado—one male, determined by Cresson.

MESOSTENUS GRACILIS Cresson

Mesostenus gracilis CRESSON, Proc. Ent. Soc. Phila., vol. 3, 1864, p. 315, male.

Type.—No. 1180, Acad. Nat. Sci. Phila.

Nematopodius orbitalis ASHMEAD, Bull. Colo. Biol. Assn., vol. 1, 1890, p. 21, female. Type.—Cat. No. 24081, U.S.N.M. (new synonymy).

Mesostenus gracilis (Cresson) VIERECK, Smith: Insects of N. J., 1910, p. 630.

Discussion based on type, that of *orbitalis* and 20 other males and 30 other females in the National collection.

The type of *orbitalis* is in very bad condition with abdomen and many of the appendages missing, but I have no doubt of the correctness of the synonymy.

Female.—Length 6–12 mm.

Not at all like *Nematopodius*, to which genus Ashmead referred it, but a typical *Mesostenus* very closely allied to *thoracicus* Cresson, from which it differs as follows:

More slender, the thorax hardly half as deep as long; temples distinctly convex; malar space nearly as long as basal width of mandible; mesopleural impressions not at all striate; apical carina of propodeum broadly interrupted medially, not high on angles, abdomen fully a half longer than head and thorax; second tergite fully twice as long as broad at base; sheath not or barely two-thirds as long as abdomen; ovipositor much more slender, especially at apex; orbits usually continuously white, rarely interrupted at top of eyes behind; mesoscutum frequently largely reddish, with only the notauli and sutures black; front and middle coxae at most partly white, rarely partly black; hind tarsus usually entirely red, rarely with joints 2–4 whitish.

Male.—Differs from male of *thoracicus* as follows:

Temples strongly convex; propodeum finely rugose behind, apical carina usually entire, but sometimes interrupted medially, not especially higher on angles; antennae usually without annulus, rarely with a distinct annulus; hind tarsus with at most joints 2–4 white, frequently entirely black or blackish; hind coxa entirely red.

Generally distributed throughout the eastern half of the United States and extending in the South entirely across the continent and into Mexico. The type is from Virginia and that of *orbitalis* from Colorado. The specimens in the National collection are as follows: Massachusetts—Milton, July 19, 1897, S. Henshaw, one male. Connecticut—one female. New York—Ithaca, F. H. Chittenden, one female, one male. Maryland—ex *Dakruma coccidivora*, two females. District of Columbia—three females, one male. Virginia—Falls Church, July 31, 1913, W. Middleton, one female; Winchester, ex *Euzophera semifuneralis*, Quaintance No. 15403, April 23, 1919, E. B. Blakeslee, one female. Ohio—Spring Valley, September 13, 1896, one male. Illinois—Algonquin, two females, one male. Michigan—Agricultural College, two females. Wisconsin—Cranmoor, July 7, 1909, C. W. Hooker, one female. Mississippi—Biloxi, ex pupa *Laetilia coccidivora*, S. M. Tracy, one male. Louisiana—Baton Rouge, May 27, 1898, one female. Texas—Dallas, April 26, 1907, W. W. Yothers, one female; April 6, 1909, F. C. Pratt, one female; May 11, 1908, A. K. Pettit, one female; Victoria, June 2, 1906, C. R. Jones, one female; Brownsville, May, 1921, J. C. Bridwell, one male; Devils River, ex *Ozamia clarefacto*, June 1925, A. P. Dodd, one male; Uvalde, ex *Ozamia clarefacto*, May, 1925, A. P. Dodd, two females; no locality, Belfrage, one female, one male. Kansas—Riley County, October, Marlatt, one female; Manhattan, one female. Arizona—one male. New Mexico—Roswell, April 15, Cockerell, one female; Las Cruces, May 5, one female; Mesilla, October 27–30, Cockerell, two males. California—Saticoy, February 3, 1927, S. E. Flanders, one female. United States—no locality, two females, eight males. Mexico—one female from C. F. Baker collection.

MESOSTENUS LEUCOPUS Ashmead

Figs. 1e, 2g–h

Mesostenus leucopus ASHMEAD, Proc. U. S. Nat. Mus., vol. 12, 1890, p. 406, male.
Type.—Cat. No. 2018, U.S.N.M.

Discussion based on type, two other males and five females, all in the United States National Museum.

The female of this species has not been described previously.

Female.—Length, 10–12 mm.

Temples very narrow but strongly convex, sparsely punctate, polished; vertex and frons above medially rugulose; anterior orbits finely coriaceous; face medially shining and densely punctate; clypeus more sparsely punctate, strongly convex, eyes parallel; malar space barely two-thirds basal width of mandible; antennae nearly as long as body, slender, slightly thicker toward apex, basal three joints of

flagellum successively gradually shorter, fourth to sixth each about three-fourths as long as its predecessor, others very gradually shorter. Thorax shining, punctate, the punctures mostly well separated; pronotal and mesopleural impressions striate; mesoscutum more densely punctate, notauli very deep, complete, and strongly foveolate; scutellum polished, practically impunctate; propodeum with apical carina complete and almost equally strong throughout, basal areas densely punctate, middle areas more coarsely punctate, apical face transversely rugose; legs very slender. Abdomen very narrowly fusiform, subpolished, very faintly coriaceous, first tergite slender throughout, postpetiole barely twice as wide as petiole, nearly twice as long beyond spiracles as broad, suture between sternite and tergite obliterated; second tergite nearly or quite thrice as long as broad at base; sheath nearly as long as abdomen; ovipositor slender, slightly compressed, decurved, apex in profile slightly sinuate.

Head and thorax black with white markings as follows: Broad orbital ring, broadly interrupted at top of eye and narrowly so below; center of face and clypeus; mandibles largely; incomplete annulus centering on suture between flagellar joints 7 and 8; anterior and humeral margins of pronotum; median spot on mesoscutum; scutellum; tegulae; subalar tubercle; elongate mark on lower edge of mesopleurum; upper division of metapleurum and about upper half of lower division; and posterior face of propodeum except a broad median black stripe; wings clear hyaline, venation brown, stigma paler; legs testaceous, front coxa and trochanter largely whitish, hind tibia largely and tarsus yellowish; abdomen entirely pale ferruginous.

Male.—Like female except temples broader; face entirely white antenna without annulus; propodeum with middle areas very coarsely, somewhat longitudinally rugose dorsally, transversely so laterally, apical face coarsely reticulate rugose; thoracic markings slightly smaller; basal joint of hind trochanter and femur dorsally piceous, tibia largely black, more or less reddish below and near base, tarsus yellow with apical joint and base of first joint black; abdomen very slender, compressed, black with base and apex of first tergite and broad apices of all others ferruginous.

The type is from Illinois, where it is said to have been reared by F. M. Webster as a parasite of a sawfly found on wheat. The other specimens are as follows: Lawrence, Kans., July 13, 1896, Hugo Kahl, one female; Rosslyn, Va., H. H. Smith, one male; Maryland—Glen Echo, R. M. Fouts, one female; Baltimore, one female; District of Columbia, June 15, 1914, F. Knab; and one of each sex without labels.

MESOSTENUS PROMPTUS Cresson

Mesostenus promptus CRESSON, Can. Ent., vol. 10, 1878, p. 209, male. *Type*.—No. 1186, Acad. Nat. Sci. Phila.

Mesostenus americanus CRESSON, Can. Ent., vol. 10, 1878, p. 209, female. *Type*.—No. 1170, Acad. Nat. Sci. Phila.

Exetastes brevipennis PROVANCHER, Nat. Can., vol. 11, 1879, p. 213; Faune Ent. Can., Hym., 1883, p. 386, female, male. *Type*.—See discussion.

Mesostenus promptus (Cresson) PROVANCHER, Faune Ent. Can., Hym., 1883, p. 785.

Mesostenidca americana (Cresson) VIERECK, Hym. Conn. (1916) 1917, p. 329.

Mesostenus brevipennis PROVANCHER, Faune Ent. Can., Hym., 1883, p. 794

Mesostenus promptus (Cresson) PROVANCHER, Addit. Faune Can., Hym., 1889, p. 455, index.

Discussion based on types of *promptus* and *americanus*, notes on *brevipennis* by S. A. Rohwer, and three females and two males in the National Museum.

There appears to be no reason for doubt that *promptus* and *americanus* are the sexes of the same species, and S. A. Rohwer, who examined the probable types of *brevipennis*, indicated in his notes that Provancher was correct in synonymizing his species with *promptus*. He writes that there are no specimens in the Provancher collection under the name *brevipennis*, but that the two under *promptus* appear to be properly identified.

Female.—Length, 8–12 mm.

Temples oblique, weakly convex, polished, sparsely and weakly punctate; frons and face medially densely punctate; eyes parallel within; malar space subequal to basal width of mandible; antennae distinctly shorter than body, flagellar joints successively gradually shorter from base. Thorax more than half as deep as long, dorsally polished and sparsely punctate, laterally more densely punctate and sometimes largely rugulose so, ventrally more finely and sparsely punctate; notauli fine, complete; propodeum rugose punctate, basally sparsely punctate, apical carina broadly interrupted medially; wings rather short, areolet rather shorter and broader than usual with recurrent nearly interstitial, nervulus practically interstitial, nervellus with upper abscissa perpendicular to cubitella; abdomen slender, very finely coriaceous, first tergite polished, postpetiole longer beyond spiracles than broad, second tergite fully twice as long as broad at base; sheath nearly as long as abdomen; ovipositor slender, compressed, decurved, subsagittate at apex.

Head and thorax black, abdomen ferruginous, immaculate except for a small incomplete annulus centering on flagellar joint 8 and sometimes minute white spots on frontal orbits and scutellar carinae; legs black, front and middle tibiae and tarsi and hind tarsus apically

more or less reddish, hind femur varying from black to ferruginous, in the latter case the front and middle femora also largely ferruginous in front; wings uniformly infumate.

Male.—Differs from female principally as follows: Anterior orbits white, narrowly on frons, broadly on face, clypeus, and mandibles white; antennae immaculate; collar, humeral margin of pronotum, tegulae, subalar tubercle, scutellum and its basal carinae, underside of front and middle coxae and trochanters, and joints 2-4 of hind tarsus white; propodeum more coarsely sculptured, apical carina more nearly complete, interrupted only by a narrow median foveolate groove; abdomen narrower, subcompressed toward apex; wings longer, hyaline.

The type of *promptus* is from Illinois, that of *americanus* from Maine, and that of *brevipennis* from Canada. The United States National Museum specimens are as follows: Ames, Iowa, August 13, 1925, one female; Pringle, S. D., July 15, 1924, one female; Colorado, C. F. Baker collection, one female; and two males without labels. The Colorado specimen is a homotype (Cushman) of *americanus* and one of the males has been compared by Cushman with the type of *promptus*.

MESOSTENUS MELANURUS, new species

Very distinct because of its broad temples, short, thick thorax, immaculate antennae, and polished abdomen.

Female.—Length, 7 mm.

Temples nearly as broad as eyes, very strongly convex, distinctly punctate; frons and face punctate, more densely so medially; eyes parallel; malar space very nearly as long as basal width of mandible; antennae apparently nearly as long as body (extreme apices gone), first joint of flagellum about a third longer than second, others gradually, successively shorter. Thorax but little more than a half longer than deep, dorsally and ventrally polished and rather sparsely punctate, laterally opaque and finely, very densely, almost reticulate, punctate; propodeum very short, apical carina obsoletely interrupted medially, ascending much more closely than usual to basal carina, hardly more prominent at angles, basal areas polished and sparsely punctate, middle areas obliquely rugulose, apical area reticulate rugulose; areolet elongate, recurrent antefurcal; nervulus antefurcal; abdomen polished, almost impunctate, postpetiole much shorter beyond spiracles than broad, second tergite hardly a half longer than broad at base; sheath nearly as long as abdomen; ovipositor slender, slightly compressed, decurved, elongately subsagittate at apex.

Black, postpetiole, second tergite and base of third dark ferruginous; antenna without annulus, legs black, more or less distinctly reddish beyond femora; wings infumate, front wing darker.

Type-locality.—Calgary, Alberta.

Type.—Cat. No. 40591, U.S.N.M.

One female captured May 12, 1923 by George Salt.

Genus DEROCENTRUS Cushman

Derocentrus CUSHMAN, Proc. Ent. Soc. Wash., vol. 21, 1919, p. 113. *Genotype*.—(*Coleocentrus texanus* Ashmead) = *Mesostenus macilentus* Cresson.

Very close allied to *Mesostenus*, but immediately separable by the very long apical joint of hind trochanter and in female by the very long ovipositor.

The antennae in female and the legs are excessively slender; the first tergite is straight; the second tergite is very nearly as long as the first and fully four times as long as broad at base, just behind which it is slightly constricted; the front tarsus is twice, and its basal joint nearly, as long as tibia; the apical joint of the hind trochanter is about twice as long as the basal joint and nearly half as long as the femur; the areolet is more elongate, the ovipositor is nearly or quite twice as long as the body. Otherwise agrees well with the foregoing description of *Mesostenus*.

Only one species, having several synonyms, is thus far known.

DEROCENTRUS MACILENTUS (Cresson) (new combination)

Figs. 3g, 4a, 6l

Mesostenus longicaudis CRESSON, Trans. Amer. Ent. Soc., vol. 4, 1872, p. 164, female. (Not Brullé). *Type*.—Cat. No. 1578, U.S.N.M.

Mesostenus macilentus CRESSON, Can. Ent., vol. 10, 1878, p. 210, male. *Type*.—No. 1183, Acad. Nat. Sci. Phila.

Mesostenus gracilipes, CRESSON, Proc. Acad. Nat. Sci. Phila., 1878, p. 365, female. *Type*.—No. 1179, Acad. Nat. Sci. Phila.

Coleocentrus texanus ASHMEAD, Proc. U. S. Nat. Mus., vol. 12, 1890, p. 444, female. *Type*.—Probably Cat. No. 1578, U.S.N.M. *Paratype*.—Cat. No. 2105, U.S.N.M.

Mesostenus macrurus DALLA TORRE, Cat. Hym., 1901–1902, p. 544.

Nematopodius longicaudus (Cresson) ASHMEAD, Proc. Wash. Acad. Sci., vol. 4, 1902, p. 206, female not male.

Nematopodius exclamans VIERECK, Trans. Kans. Acad. Sci., vol. 19, 1904, p. 318, female. *Type*.—Kansas University.

Nematopodius gracilipes (Cresson) VIERECK, Trans. Kans. Acad. Sci., vol. 19, 1904, p. 318.

Nematopodius longicaudus (Cresson) VIERECK, Trans. Kans. Acad. Sci., vol. 19, 1904, p. 318.

Nematopodius macilentus (Cresson) VIERECK, Trans. Kans. Acad. Sci., vol. 19, 1904, p. 319.

Derocentrus texanus (Ashmead) CUSHMAN, Proc. Ent. Soc. Wash., vol. 21, 1919, p. 114.

Derocentrus gracilipes (Cresson) CUSHMAN, Proc. Ent. Soc. Wash., vol. 21, 1919, p. 114.

In spite of the great difference in color between the sexes there seems to be no doubt that they belong to the same species.

Discussion based on types of *longicaudus*, *macilentus*, *texanus* (apparently the same specimen as type of *longicaudus*) and the paratype of *texanus*, a homotype (Gahan) of *exclamans*, a homotype (Cushman) of *macilentus*, a specimen compared by Cushman with the type of *gracilipes*, and 20 other females and 23 other males.

Female.—Length, 8–12 mm.

Temples convexly receding; malar space nearly as long as basal width of mandible; flagellum very slender and of uniform thickness, first joint fully eight times as long as thick. Thorax twice as long as deep, sparsely punctate dorsally and ventrally, more densely so laterally; pronotum polished, practically unsculptured except a foveolate groove along posterior margin; notauli foveolate; propodeum opaque rugulose; nervellus broken not far below middle, reclivous, upper abscissa perpendicular to cubitella. Abdomen subpolished, very faintly coriaceous; first tergite polished.

Body and legs nearly uniformly ferruginous, ventrally and about the scutellum and postscutellum more or less stained with black; antennae ferruginous at base, black beyond with a small, incomplete annulus centering on flagular joint 8; wings uniformly pale infumate.

Male.—Temples nearly as broad as eyes and more strongly convex than in female; malar space barely two-thirds basal width of mandible; flagellum rather stout at base, tapering toward apex, first joint hardly four times as long as thick. Thorax more coarsely sculptured; lateral impression of pronotum strongly striated; abdomen linear.

Head and thorax black with whitish markings as follows: Orbits, except interruption at top of eye and usually in malar space; sometimes middle of face and clypeus; mandibles; anterior and humeral margins of pronotum; spot in middle of mesoscutum; scutellum; subalar tubercle; usually an elongate mark or two spots on lower part of mesopleurum; upper division of metapleurum and about the dorsal half of lower division, and sides of apical face of propodeum broadly; antennae black, scape rarely reddish; legs testaceous, coxae usually more or less white, sometimes more or less black at base; basal joint of hind trochanter sometimes piceous; apex of tibia and first, fourth, and fifth tarsal joints sometimes more or less blackish, joints 2 and 3 largely white; wings paler than in female; abdomen fer-

ruginous, frequently more or less stained with black ventrally and apically.

Except for the lack of black bands on the abdomen the male is very similar in color to *Mesostenus leucopus* Ashmead.

The type of *macilentus* is from Louisiana, that of *longicaudus* from Texas, that of *gracilipes* from California, that of *texanus* from Texas (paratype from South Carolina), and that of *exclamans* from Kansas. The additional specimens in the National collection are as follows: New Jersey—Bridgeton, July 16, 1924, L. A. Stearns, one female. Maryland—Dorchester County, October 2, two females; Marshall Hall, August 29, one male. District of Columbia—one female. Virginia—Falls Church, September 2, 1918, R. A. Cushman, six males; Leesburg, September 26, 1918, G. W. Underhill, one female. Ohio—no locality, C. H. Kennedy, one female; Columbus, July 21, 1920, A. E. Miller. Kansas—Riley County, May 22, F. Marlatt, one female. Colorado—no locality, C. F. Baker collection, one female, six males; Rocky Ford, April 16–24, 1921, reared but host not given, C. E. Mickel, one female, two males. Texas—Paris, October 7, 1904, A. A. Girault, one female; Chilli-cothe, August 17, 1909, T. D. Urbahns, two females; Cotulla, May 12, 1906, J. C. Crawford, one female, April 17, 1906, F. C. Pratt, one male; Victoria, April 6 and July 11–28, J. D. Mitchell, four females, two males; Corpus Christi, one male; Brownsville, July 6, one female. New Mexico—Las Cruces, T. D. A. Cockerell, three males.

Genus POLYCYRTUS Spinola

Polycyrtus SPINOLA, Ann. Soc. Ent. France, vol. 9, 1840, p. 154. *Genotype*.—*Polycyrtus histrio* Spinola.

Polycyrtimorpha VIERECK, Proc. U. S. Nat. Mus., vol. 46, 1913, p. 383. *Genotype*.—*Polycyrtimorpha amoenus* Viereck.

The single character on which Viereck founded his *Polycyrtimorpha* (the occipital carina joining the hypostomal carina) is apparently not of generic value. At the point where the occipital carina bends toward the hypostomal carina it varies greatly in height, increase in height being accompanied by reduction in strength toward the hypostomal carina sometimes to the point of virtual disappearance.

Head broadly transverse, temples sharply receding; occipital carina frequently very high, frequently very prominently angled below and not reaching hypostomal carina, latter high and flangelike; eyes more or less convergent below; frons with a stout median horn; clypeus very strongly elevated, apically inflexed and with a narrow reflexed margin; malar space long; upper tooth of mandible more or less distinctly longer than lower tooth; antennae long, slender, in female

slightly thickened in middle, tapering and flattened below toward apex, in male of nearly uniform thickness except apical taper. Thorax long, distinctly compressed, polished, at most sparsely sculptured; humeral margins of pronotum swollen and angled by epomia; notauli complete, the mesoscutal lobes very high; scutellum narrow, immargined, its basal ridges very high and thick; propodeum with only one complete transverse carina, the basal, apical carina always wanting medially and usually represented only by very long apophyses; spiracle large, oval; stigma very narrow, radius before middle; areolet elongate, wider at apex than at base, recurrent at or near apex; postnervulus broken at or near middle; nervellus reclivous, its upper abscissa perpendicular to cubitella; legs slender. Abdomen slender, usually with long sparse hairs toward apex; first sternite fused with tergite and extending beyond spiracles, postpetiole only a little wider than petiole; sheath not or barely as long as abdomen; ovipositor compressed, sagittate at apex.

This is a typically tropical genus containing only one North American species.

POLYCYRTUS NEGLECTUS Cushman

Figs. 1f, 3h, 6k

Polycyrtus neglectus CUSHMAN, Proc. U. S. Nat. Mus., vol. 67, art. 23, 1926, p. 5, females, males. *Type*.—Cat. No. 27683, U.S.N.M.

The original description of this species is so recent and so detailed that a full description here is unnecessary.

A few points suggested by the above generic description may be added. The occipital carina is not especially prominent nor is it toothed or interrupted below; eyes very slightly convergent; upper tooth of mandible very slightly longer than lower; antennae about three-fourths as long as body.

In addition to the 11 females and 16 males of the type series the National collection contains the following specimens: Maryland—Glen Echo, R. M. Fouts, one female, three males; Cabin John, June 23, 1917, R. M. Fouts, two females. Pennsylvania—Inglenook, June 20, 1909, P. R. Myers, one female; Marsh Run, York County, July 18, 1909, P. R. Myers, one male. Connecticut—Lyme, August 28, 1909, A. B. Champlain, two males.

The Connecticut specimens extend the known range of the species about 200 miles farther to the north.

Genus POLYCYRTIDEA Viereck

Polycyrtidea VIERECK, Proc. U. S. Nat. Mus., vol. 46, 1913, p. 382. *Genotype*.—*Polycyrtidea gracilis* Viereck.

If I interpret the very brief original description correctly *Mesostenus pusillus* Cresson and *Agrypon flavopictus* Ashmead, both from

the West Indies, belong here. The latter species, except in size, agrees rather closely with the description of the genotype, which is practically entirely of coloration.

Temples convexly receding; frons very deeply concave, horn pyramidal with a carina on each side and one below running from base to apex, the base broad; eyes slightly convergent; malar space subequal to basal width of mandible; clypeus elevated; occipital carina neither angulate nor interrupted below; upper tooth of mandible longer than lower; antennae in female about three-fourths as long as body, slender, slightly thickened beyond middle, not flattened below, tapering at apex, in male slender throughout. Thorax robust, much more than half as deep as long, compressed; humeral margins of pronotum subangularly tuberculate in front; notauli deep at least anteriorly; scutellum broader than long, strongly convex; propodeum with basal carina close to base and with more or less distinct traces of apophyses, sloping precipitously behind basal carina, spiracles small oval; stigma very narrow; areolet very small, open behind; discoidal cell pointed at base; nervulus antefurcal; nervellus inclivous, broken near bottom or not broken; legs very slender, the hind femur slender subclavate, longer calcarium fully half as long as basitarsus. Abdomen slender; first sternite extending far beyond spiracles, completely fused with tergite, postpetiole only slightly wider than petiole; second tergite fully as long as first, these two together comprising much more than half total length of abdomen; sheath not or barely as long as first tergite; ovipositor slender, compressed, elongate sagittate at apex.

The genus is apparently wholly tropical in its range, the single species occurring within the borders of the United States, being known only from the extreme southern point of Texas.

(MESOSTENUS) POLYCYRTIDEA PUSILLUS (Cresson) (new combination)

(AGRYPON) POLYCYRTIDEA FLAVOPICTUS (Ashmead) (new combination)

These two West Indian species are not known to occur on the continent and are included here only to record the generic transfers.

POLYCYRTIDEA LIMITIS, new species

Figs. 1g, 6m

Female.—Length, 9 mm.

Temples and vertex behind ocelli polished, frons medially rugulose; face, malar space, and clypeus basally opaque coriaceous, the face densely and clypeus sparsely punctuate; malar space fully as long as basal width of mandible. Thorax coarsely sculptured, pro-

notum laterally rugose, mesoscutum and scutellum sparsely punctate, mesopleurum above longitudinally striate, below sparsely punctate, sternum and metapleurum densely punctate, speculum and lower angle of upper division of metapleurum polished and unsculptured; notauli complete; propodeum polished before basal carina opaque reticulate rugulose behind, apophyses represented by low rounded tubercles. Abdomen opaque, very finely coriaceous, first tergite polished, sheath distinctly shorter than first segment.

Head and thorax piceous black and yellow, the yellow more extensive than the black, embracing the following: Head except middle of frons and vertex and occiput; under side of scape; an incomplete annulus on flagellar joints 6-11 (antennae otherwise black); all of pronotum except a narrow transverse band across middle; inner posterior edges of lateral lobes of mesoscutum and the outer anterior edges of middle lobe; scutellum, its basal carinae, and postscutellum; tegulae and subalar tubercles; most of mesopleurum, sides of sternum, and both divisions of metapleurum; propodeum beyond basal carina except lateral anterior corners and a small median apical spot; prepectus and mesosternum reddish; legs testaceous; front and middle tibiae and tarsi stramineous; hind tarsus blackish at base and apex, first joint largely, second entirely, and third apically white; wings hyaline, venation blackish; abdomen ferruginous, base of petiole and second and third tergites except broad apical and lateral margins blackish.

Type-locality.—Brownsville, Tex.

Type.—Cat. No. 40592, U.S.N.M.

One specimen taken September 29, 1906, J. C. Crawford.

ACERASTES, new genus⁶

Very closely related to *Polycyrtidea* Viereck and should, perhaps, be considered merely a subgenus of that genus. But the genotype and two apparently undescribed Neotropical species differ from the three species of *Polycyrtidea* in lacking the frontal horn and in having the areolet rather large, well defined, and pentagonal, though open behind, with the recurrent before the middle and the cubitus beyond the recurrent weak and bent sharply forward at recurrent and then sharply backward at the position of the second intercubitus.

Genotype.—*Mesostenus pertinax* Cresson.

Three specimens of one of the undescribed species referred to were reared from a spider egg-sac.

Represented in the United States only by the genotype.

⁶ From α-κεραστης = without a horn, referring to the lack of a frontal horn.

ACERASTES PERTINAX (Cresson) (new combination)

Figs. 3i, 5, 6n

Mesostenus pertinax CRESSON, Trans. Amer. Ent. Soc., vol. 4, 1872, p. 163, female. *Type*.—Cat. No. 1429, U.S.N.M.

Discussion based on type and three other females, all in the National collection.

Female.—Length, 5.5 mm.

Head polished behind; frons with a weak median carina and very faintly coriaceous; face, clypeus and malar space opaque coriaceous, the face medially and clypeus basally minutely punctate; eyes slightly convergent below; malar space hardly as long as basal width of mandible; antennae very nearly as long as body, slender, barely thicker beyond middle. Thorax nearly twice as long as deep, pronotum polished, foveolate along posterior margin; mesoscutum polished, middle lobe sparsely punctate anteriorly and with a median groove posteriorly, notauli deep and complete; scutellum polished; mesopleurum striate in impression, punctate below, speculum polished, mesosternum finely punctate; metapleurum more coarsely punctate, upper division polished in lower angle; propodeum polished before basal carina, finely reticulate rugose behind, apex transversely so, apophyses represented by small tubercles; nervellus reclivous, upper abscissa perpendicular to cubitella; legs slender, but not so slender as in *Polycyrtidea limitis*, the hind femur not subclavate. Abdomen somewhat broader than in *Polycyrtidea*, very minutely coriaceous, except first tergite, which is polished, postpetiole at apex twice as broad as petiole; sheath little more than half as long as first tergite; ovipositor compressed, sagittate at apex.

Head and thorax black and yellow, more yellow than black, with base of propodeum reddish piceous to ferruginous; yellow as follows: Head, except occiput and middle of face and frons, under side of scape and first two or three flagellar joints, and a complete annulus on flagellar joints 6–9; anterior and humeral margins of pronotum, two elongate marks on disk of mesoscutum, scutellum and its basal carinae, postscutellum; subalar tubercle, speculum, and lower half of mesopleurum; sternum (sometimes reddish); both upper and lower divisions of metapleurum; and propodeum behind basal carina except in anterior angles and apical middle; wings hyaline, venation brown; legs testaceous, front coxae and trochanters and sometimes the other coxae more or less stramineous; hind tarsus reddish or fuscous, usually with second and third joints more or less white; abdomen ferruginous, petiole somewhat paler.

The type and one of the other specimens are from the Belfrage Texas collection; a third is from Plano, Tex., October, E. S. Tucker; and a fourth from Minatitlan, Mexico, February 1, 1892, Herbert Osborn.

The type has the propodeum basally red and the hind tarsus entirely red.

Genus *POLISTIPHAGA* Cushman

Polistiphaga CUSHMAN, Journ. Wash. Acad. Sci., vol. 15, 1925, p. 391. *Genotype*.—(*Mesostenus arvalis* Cresson)=*Mesostenus fulvus* Cresson

It might be argued that this genus should be relegated to the Hemitelini because of the areolation of the propodeum and the open areolet, but the general appearance and structure indicate its affinity with the Cryptini. All of the basal and apical areas are defined, while the carinae separating the areas between the transverse carinae may or may not be present, in the latter case perhaps adventitiously due to the exaggeration of certain of the rugae lying in that region.

The generic description is too recent and too detailed to require repetition here, but certain features not there mentioned may be added. Eyes slightly convergent below; frons with a median carina, but without a horn; notauli complete; areolet elongate, open, recurrent at or near position of second intercubitus; discoidal cell broad at base; nervulus antefurcal; nervellus inclivous, broken below middle; first abdominal segment decurved, sternite not or barely reaching spiracles, postpetiole abruptly widened and much wider than petiole; abdomen rather broadly fusiform, coriaceous, impunctate; sheath shorter than first segment; ovipositor compressed, sagittate at apex.

The following two species occur in the restricted region. Both are parasitic in the nests of wasps of the genus *Polistes*:

1. Thorax and abdomen largely red-----*fulva* (Cresson).
Thorax and abdomen black and yellow-----*zonata*, new species.

POLISTIPHAGA FULVA (Cresson)

Fig. 6o

Mesostenus? fulvus CRESSON, Proc. Ent. Soc. Phila., vol. 3, 1864, p. 316, male.
Type.—No. 1178, Acad. Nat. Sci. Phila.

Mesostenus arvalis CRESSON, Trans. Amer. Ent. Soc., vol. 14, 1872, p. 163, female.
Type.—No. 1171, Acad. Nat. Sci. Phila.

Mesostenidea (*Christolia*) *arvalis* (Cresson) VIERECK, Hym. Conn. (1916) 1917, p. 329 and 330.

Polistiphaga arvalis (Cresson) CUSHMAN, Journ. Wash. Acad. Sci., vol. 15, 1925, p. 391.

Discussion based on types of both names, two paratypes of *arvalis*, a homotype (Cushman) of *fulva*, and 38 other females and 18 other males, all but the types in the National collection.

Female.—Length, 5–9 mm.

Head, thorax, and abdomen opaque, finely coriaceous, the head and thorax with additional coarser sculpture, the abdomen without additional sculpture; frons medially rugulose; face finely punctate;

pronotal impressions striate; mesoscutum densely, finely punctate; mesopleurum, sternum and metalpleurum finely punctate, the pleura more or less striately so; basal areas of propodeum without coarse sculpture, middle areas longitudinally, apical areas transversely rugose; areolet rather large, the lumen several times broader than the thickness of the surrounding veins.

Ferruginous; occiput and middle of vertex and frons more or less stained with black; head otherwise yellow; antennae black, scape pale below, a short white annulus centering on suture between flagellar joints 7 and 8; mesoscutum darker than rest of thorax; a band across middle of pronotum, notauli, and sutures on dorsum of thorax blackish; anterior and humeral margins of pronotum, scutellar carinae, tegulae, subalar tubercles, sternaui, sutures on sides of thorax, and apophyses yellowish; wings hyaline, venation brown, stigma pale; legs concolorous, hind tarsus with joints 2-4 yellow, 5 black; abdomen immaculate.

Male.—Differs practically only sexually from female. A little more contrastingly colored, and with antennal annulus occupying flagellar joints 9-11.

The type is from Illinois, the type series of *arvalis* from Texas. The other specimens in the National collection are as follows: Ontario—Toronto, three females, two males. New York—Long Island, one female. Illinois—Chicago, one female. Wisconsin—Milwaukee County, two males. Maryland—Glen Echo, R. M. Fouts, one male. Virginia—Near Stubblefield Falls, October 23, 1921, J. R. Malloch, one female; October 30, 1921, W. L. McAtee, one female. Charlottesville, July 10, 1922, A. M. Vance, one female. Arkansas—one female from collection of C. F. Baker. Texas—Belfrage collection, twelve females, four males; Dallas, September 26, 1905, A. J. Leister, seven females, four males, including the homotype; Rosser, ex nest of *Polistes* (Hunter No. 1123), September 25, 1905, C. R. Jones, five females, three males. Kansas—parasite of *Polistes*, 1872, C. V. Riley, three females, two males; Riley County, Marlatt, September, two females; Manhattan, August 23, 1920, R. C. Smith, one female (said to have been reared as a parasite of a noctuid larva on alfalfa). California—Huntington Beach, September 25, 1904, E. S. G. Titus, one male; Humboldt County, June 12, H. S. Barber, one female.

POLISTIPHAGA ZONATA, new species

Fig. 3m

Very distinct from *fulva* in its black and yellow color as well as in certain features of structure.

Female.—Length 7 mm.

Head finely coriaceous opaque, frons medially rugose, face very finely punctate, malar space very nearly as long as basal width of

mandible; occipital and hypostomal carinae meeting very close to ventral articulation of mandible. Thorax finely opaque coriaceous, depressions of pronotum and upper part of mesopleurum, striate; middle and posterior areas of propodeum weakly rugose, the petiolar areas subpolished; thorax otherwise at most sparsely punctate; areolet very small, the lumen hardly as broad as thickness of the surrounding veins. Abdomen finely coriaceous, opaque.

Black with profuse yellow markings as follows: Orbits, nearly meeting behind ocelli, face, mouth parts, under side of scape, and annulus occupying flagellar joints 6-11; anterior and humeral margins of pronotum, propleura, lateral margins of prescutum and inner margins of lateral lobes of mesoscutum, scutellum, postscutellum, tegulae, mesopleurum except impressions, prepectus, sternum, both upper and lower divisions of metapleurum largely, propodeum behind basal carina except middle of petiolar area and narrow marks along lateral margins; and broad apical and lateral margins of tergites; wings hyaline, veins brown, stigma pale; legs pale testaceous, coxae and trochanters paler above, hind coxa with a blackish streak above; hind tarsus with joints 2-4 white, 5 black.

Type-locality.—Victoria, Tex.

Host.—*Polistes maculata*.

Type.—Cat. No. 40593, U.S.N.M.

Five females in poor condition reared November 10, 1914, by J. D. Mitchell.

SPECIES WRONGLY REFERRED TO MESOSTENINI

The name in parentheses is that of the author of the species and the name following the parentheses is that of the authority for the transfer. The words "Rohwer notes" indicate that the transfer is made on the basis of the examination of the type by S. A. Rohwer, or confirmed by his examination.

(*Mesostenus*) *Phygadeuon albicoxus* (Provancher) Provancher. This transfer was made in "Faune Ent. Can. Hym., 1883, p. 318."

(*Mesostenus*) *Mesoleptus albifacies* (Provancher) Davis, Rohwer notes.

(*Mesostenus*) *Cratichneumon annulatus* (Provancher) Roman.

(*Mesostenus apicalis* Provancher) = *Amblyteles finitimus* (Creson). New combination.

(*Mesostenus longicornis* Provancher) = *Mesoleptus moyeni* (Provancher, *teste* Provancher, Davis and Rohwer notes.

(*Mesostenus*) *Phygadeuon flavipes* (Provancher) Davis, Rohwer notes.

(*Mesostenus*) *Tryphonini latigaster* (Provancher), Rohwer notes.

(*Mesostenus*) *Pezoporus nigricornis* (Provancher), new combination, Rohwer notes.

(*Mesostenus nitidus* Provancher) = *Pezoporus nitidulus* (Provancher), new combination.

[(*Mesostenus*) *Phytodietus nobilis* (Provancher) Davis] = *Phytodietus distinctus* (Cresson), teste Rohwer.

(*Mesostenus pallipes* Provancher) = (*Mesoleptus*) *Thysiotorus triangularis* (Cresson), new combination.

(*Mesostenus pluricinctus* Provancher) = *Diacritus muliebris* (Cresson), teste Cushman.

(*Mesostenus ruficornis* Provancher) = *Pezoporus nitidulus* (Provancher), teste Provancher.

Mesostenus ruficoxus Provancher. After its original description⁷ this species is not again mentioned by Provancher, and neither Davis nor Rohwer was able to find the type. The large areolet would exclude it from *Mesostenus*.

(*Mesostenus rufipes* Provancher) = *Diacritus muliebus* (Cresson), teste Cushman.

Mesostenus rufotinctus Provancher. The remarks above concerning *ruficoxus* apply also to this species.

(*Mesostenus*) *Panargyrops sericeus* (Provancher) Cushman.

(*Mesostenus tarsatus* Provancher) = (*Cryptus americanus* Cresson, teste Provancher) = *Cryptus vinctus* (Say), teste Cushman and Gahan.

(*Nematopodius*) *Gambrus canadensis* (Provancher), new combination.

(*Nematopodius coxatus* Provancher) = (*Cryptus americanus* Cresson, teste Provancher) = *Cryptus vinctus* (Say), teste Cushman and Gahan.

⁷ Nat. Can., vol. 7, 1875, p. 266.

NEW FRESH-WATER AND MARINE BIVALVE SHELLS FROM BRAZIL AND URUGUAY

By WILLIAM B. MARSHALL

Assistant Curator, Division of Mollusks, United States National Museum

The Brazilian pearly fresh-water mussel described in this paper came from Arcas, Minas Geraes, Brazil, and was presented by Mr. Ralph W. Jackson, of Cambridge, Md. The other four came from Canada Grande, Department of Cerro Largo, Uruguay. These and the three marine shells, which came from the southeast coast of Uruguay, were presented by Dr. F. Felippone, of Montevideo, Uruguay.

DIPLODON JACKSONI, new species

Plate 4, figures 1-3

Shell moderately thick, especially in the anterior portion; nearly elliptic, slightly oblique, regularly rounded in front, more sharply rounded at the rear. Dorsal margin gently arched; ventral margin slightly sloping downward from front to back; posterior margin fusing imperceptibly into the dorsal margin. Surface of the shell with an obscure depression running from the beak to a point just back of the middle of the ventral margin. Beaks set far forward; anterior area small and rapidly descending from the ridge to the anterior margin. Posterior area large; the posterior ridge low and rounded. Sculpture consisting of weak concentric striae, with the rest periods more plainly marked. Color greenish with a metallic luster, especially when the shell is wet. Interior bluish and livid, with but little iridescence. Anterior adductor scars deep and the pedal muscle scars deeply punched; posterior scars superficial. In the right valve there is one long, slightly curved lateral tooth, its summit granulated; and two pseudocardinal teeth set parallel to the anterior dorsal margin, the upper tooth small and platelike, the lower one thicker and fluted on its surface. Left valve with two lateral teeth, and one pseudocardinal nearly divided into two parts by an oblique pit. Pallial line well marked. Beaks with about 20 radiating

ridges, those in front of the middle weaker than those in the rear. The middle pairs at each stage of growth fuse into a point, each pair "nesting" into the succeeding pair like V in V. The early shell has numerous concentric threads which are more prominent in the spaces between the ridges than on the summits. On the posterior dorsal area of the young shell there are several obscure flutings running from the hindmost radial rib to the dorsal margin.

The type (Cat. No. 368260, U.S.N.M.) measures: Length, 49 mm.; height, 28 mm.; diameter, 16 mm. A paratype (Cat. No. 368261, U.S.N.M.) measures: Length, 47 mm.; height, 24.5 mm.; diameter, 15 mm. They were presented by Mr. Ralph W. Jackson, of Cambridge, Md., and come from Arcas, Province of Minas Geraes, Brazil. This locality is on a small tributary, near the source of the Rio Sao Francisco, which flows in a general northeasterly course and enters the Atlantic at about 11° south latitude. Both specimens are unusually well preserved and have the beak sculpture in nearly perfect condition. The species is closely related to *Diplodon santamariae* Simpson, but is less quadrate, has the ventral margin more oblique, and has the undulations of the beaks finer, closer, and covering only about half as much area. The color of *D. santamariae* is rich chestnut brown, while *D. jacksoni* is greenish with metallic luster. Evidently it is related to and groups with *D. wagnerianus* Simpson (+ *ellipticus* Wagner), a species occurring in the Rio Sao Francisco.

DIPLODON PILSBRYI, new species

Plate 1, figures 1 and 3. Plate 3, figure 2

Shell rather inflated, oval in outline, rounded in front, obtusely pointed at the rear, rather thin for its size and genus. Dorsal line arcuate, fading into the posterior margin without a pronounced angle, joining the anterior margin at nearly a right angle. Ventral margin curved throughout its whole length, broadly rounding into the anterior margin and making a rounded point with the posterior margin. Beaks at about the anterior quarter of the length. Posterior ridge high and rounded and descending gradually to the posterior margin. Descent at the anterior end steep. Sculpture of numerous, concentric lines of growth, the posterior area with two obscure radiating riblets. Rest periods about five, indistinct. Color uniform dark chestnut. Left valve with one pseudocardinal tooth which is long, compressed, and rather low. Right valve with two long, low, compressed pseudocardinals, the groove between them narrow and shallow. Left valve with two low lateral teeth of nearly equal size, beginning a little remotely from the beak. Right valve with one rather high, thin lateral, its upper margin crenulated. Anterior adductor scars deep, posterior ones well impressed. Beak cavities

with a row of muscle scars deeply punched. Nacre faded and diseased, evidently white when normal. Pallial line well marked, located about 10 mm. above the ventral margin.

The type (Cat. No. 368237, U.S.N.M.) measures: Length, 97 mm.; height, 53 mm.; diameter, 30 mm. It comes from Canada Grande, Department of Cerro Largo, Uruguay, and was presented by Dr. Florentino Felippone.

This species will for the present stand by itself, as it shows but little relationship to any species hitherto described. The beaks are deeply eroded and but little may be said of their characters. The right beak gives indications that its sculpture consisted of five or six very strong radiating ribs. In form the shell is very similar to many specimens of the common *Anodonta cataracta* Say of the eastern United States. If lying with a lot of that species it would pass as a slight variation of it.

The species is named in honor of Dr. H. A. Pilsbry.

ANODONTITES ELFA, new species

Plate 4, figures 4-6

Shell rather small and thin, ovate-elliptic, narrow and rounded in front, broad and obtusely pointed at the rear. Dorsal edge nearly straight, rounding into the anterior margin, and joining the posterior margin in a very obtuse angle. Beaks set about 16 mm. behind the anterior end, and 40 mm. in front of the posterior end. General surface of the shell rounding to the margins without making a distinct ridge at either end. Descent to the posterior margin gradual; to the anterior margin rather abrupt. Sculpture of concentric growth striae and several more distinct lines indicating rest periods, and hints of radiating ruffles. Periostracum smooth and glossy at the front and middle of the shell, posterior area much roughened by lamellae of fugacious periostracum. Color bipartite, rich dark chestnut anteriorly, lighter chestnut posteriorly, the line of separation of the two tints running from the beak to the middle of the ventral margin. Interior much faded and chalky, but evidently greenish in color and with apparent radiating striae. Anterior adductor scars lightly impressed, posterior scars superficial. Prismatic margin very broad near the anterior end of the ventral margin and here the interior is flattened instead of concave. Pallial line about 6.5 mm. above the ventral margin.

The type (Cat. No. 368998, U.S.N.M.) measures: Length, 56 mm.; height, 32 mm.; diameter, 18 mm. It comes from Canada Grande, Department of Cerro Largo, Uruguay and was presented by Doctor Felippone. Cat. No. 368999, U.S.N.M., includes one right valve and one left valve, not mates, from the same locality. Cat. No. 335740,

U.S.N.M., includes a specimen from Rio Tacuari, Department of Cerro Largo, also from Doctor Felippone.

Despite its greater length as compared with its height, this shell is closely related to the plentiful *Anodontites patagonicus* Lamarek (*A. latomarginatus* Lea). This relationship is indicated by the very broad prismatic border and the bipartite coloring of both species. The darker coloring covering the surface from the front to the middle probably indicates the depth to which the shell buries itself in the mud or sand.

ANODONTITES MANSFIELDI, new species

Plate 2, figures 1-3

Shell moderately thick and inflated, subquadrate-elliptic, rounded at both ends, both the dorsal and ventral margin slightly arcuate. Beaks set well forward, about 15 mm. from the anterior end, 50 mm. from the posterior end. Shell rounding from the high middle to the anterior and posterior margins without distinct ridge at either end. Sculpture of well-marked concentric riblets indicating periods of rest in growth. Periostracum smooth and glossy. Color rich, reddish-chestnut, with two radiating greenish rays on the posterior dorsal area. Interior livid and rose color, the latter color richer in the adductor scars and in the area between the pallial line and the margin. Prismatic border still darker, pallial line about 8 mm. from ventral margin. Anterior adductor scar well impressed, the posterior one lightly impressed.

The type (Cat. No. 368254, U.S.N.M.) measures: Length, 65 mm.; height, 37 mm.; diameter, 23 mm. It comes from Canada Grande, Department of Cerro Largo, Uruguay, and was presented by Doctor Felippone.

In color, periostracum, interior features, especially color and in the width of the prismatic border, this shell is related to *Anodontites wymani* Lea. In form the relationship is not so evident, as *Anodontites mansfieldi* is subquadrate-elliptic, while *Anodontites wymani* is ovate, narrow in front, and rather sharply pointed at the rear. The species is named in honor of Dr. W. C. Mansfield, of the United States Geological Survey.

MYCETOPODA FELIPPONEI, new species

Plate 1, figure 2. Plate 3, figures 1 and 3

Shell elongate, oblique, very compressed, much narrowed in front, broad near the rear, and ending in a broadly rounded point at the posterior end, gaping from the point at which the dorsal margin joins the anterior margin to a point behind the middle of the ventral

margin. Dorsal line nearly straight, fading without an angle into the posterior margin, which in turn sharply rounds into the ventral margin. Ventral margin very lightly curved, sloping up to and gradually rounding into the anterior margin. Beaks set back about 20 mm. from the extreme anterior margin and 75 mm. in front of the extreme posterior point. Posterior ridge somewhat angular, but low, with the descent to the margins gradual. Anterior ridge rounded, set close to the anterior margin. Sculpture of poorly marked concentric lines of growth and obscure radiating striae, with indications of a few radiating ruffles. Color nearly uniform light chestnut. Interior rich pink lavender.

The type (Cat. No. 368235, U.S.N.M.) measures: Length, 95 mm.; height, 38 mm.; diameter, 20 mm. It comes from Canada Grande, Department of Cerro Largo, Uruguay, and was presented by Doctor Felippone.

This species is closely related to *Mycetopoda legumen* von Martens and naturally groups with it, but is much narrower in front and more oblique.

CORBULA URUGUAYENSIS, new species

Plate 4, figures 7-9

Shell rather thick, subquadrate, rounded in front, shortly truncate at the rear, the left valve smaller than the right and closing into it slightly. Dorsal line angularly arched, ventral margin slightly curved, rounding regularly into the anterior margin, and making a sharp angle with the posterior margin, the left valve more nasute than the right valve. Anterior ridge rounded, posterior ridge sharply angled; posterior area in each valve flattened, biangulate on the margin. Sculpture of many flattened, nearly regular, concentric riblets and minor concentric striae. Left valve with a prominent overhanging Mya-like chondrophore just back of the tip of the beak, and a partly hooded, concave plate just in front of it to accommodate the cardinal tooth of the right valve. Right valve with a large lightly curved cardinal tooth and an obscure, shelflike chondrophore just back of it. Color creamy-white where periostracum has disappeared from most of the shell. In left valve periostracum remains on the posterior area and in a narrow strip along the ventral margin. It is brownish, is concentrically lamellate and scaly.

The type (Cat. No. 368243, U.S.N.M.) measures: Length, 11 mm.; height, 7 mm.; diameter, 5 mm. It and four paratypes (Cat. No. 368244, U.S.N.M.) come from Cape Santa Maria, Department of Rocha, Uruguay, and were presented by Dr. Florentino Felippone.

NUCULA FELIPPONEI, new species

Plate 4, figures 10-12

Shell oblique, its dorsal margin sharply arched, its ventral margin regularly curved, anterior margin long and gently sloping; posterior margin very short, abruptly descending, making a prowlike point at its junction with the ventral margin. Beaks far back, about 3 mm. in front of extreme posterior end, and 12 mm. to the rear of the extreme anterior end, curving backward, cordate, an elongated, deeply impressed, heart-shaped escutcheon below them. Anterior area flattened, anterior ridge well marked, but rounded. Sculpture of many obscure concentric striae of growth, the rest periods somewhat emphasized. Periostracum very smooth and shining, paperlike, tending to peel off, its color light olive at the beaks, darker olive on the disk, becoming straw color near the margin. Chondrophore spoonlike, overhanging in each valve, pointing toward the postero-ventral margin, free from the posterior margin, but attached by a portion of its edge to the anterior margin. Interior white, pearly, appearing to be radially striated, the anterior margin with about 20 pearly teeth and the short posterior margin with 11. Margin not crenulated. Anterior adductor scar lightly impressed, the posterior one deep.

The type (Cat. No. 368245, U.S.N.M.) measures: Length, 12 mm.; height, 12 mm.; diameter, 8 mm. It was taken from the stomach of a fish—a croaker—in South America called a Corbina, *Micropogon undulatus* Linnaeus, in the Rio de la Plata, Uruguay, and was presented by Doctor Felippone. Cat. No. 368246, U.S.N.M. includes three paratypes.

NUCULA URUGUAYENSIS, new species

Plate 4, Figures 13-15

Shell very oblique, sharply rounded at the front, widely rounded at the rear. Dorsal margin angularly arched, posterior margin short, truncately sloping; anterior margin long, lightly arched, gently sloping. Beaks set far forward, almost directly above the posterior margin; curving backward a distinct lunule below them. Escutcheon transversely fluted with curving, waving, somewhat interrupted granulo-riblets. Anterior area with numerous flutings of the same nature, disposed to bifurcate at the anterior ridge. Anterior margins and margins of escutcheon obscurely scalloped, ventral margin internally finely, closely crenulated. Sculpture of close, flat concentric striae, the grooves between them linear and clean-cut. Whole surface microscopically radiately striate. Interior white, pearly. Posterior teeth 7 in number, anterior 13. Chondrophore an elongate wedge-

shaped groove in a plate extending from the base of the upper anterior tooth to the base of the upper posterior one. Color white, due probably to the loss of the periostracum.

The type (Cat. No. 368228, U.S.N.M.) consists of a single valve, and measures: Length, 5.5 mm.; height, 5.5 mm.; diameter if both valves were present would be about 2.75 mm. It comes from the coast of Maldonado, Uruguay. Cat. No. 368229, U.S.N.M., includes five unmatched valves, paratypes. Cat. No. 368252, U.S.N.M., includes three unmatched valves from Cape Santa Maria, Department of Rocha, Uruguay. Both localities are in the estuary of the Rio de la Plata. All the specimens were presented by Dr. Florentino Felippone.

EXPLANATION OF PLATES

PLATE 1

- Fig. 1. *Diplodon pilsbryi*, new species.
2. *Mycetopoda felipponei*, new species.
3. *Diplodon pilsbryi*, new species.

PLATE 2

- Figs. 1-3. *Anodontites mansfieldi*, new species.

PLATE 3

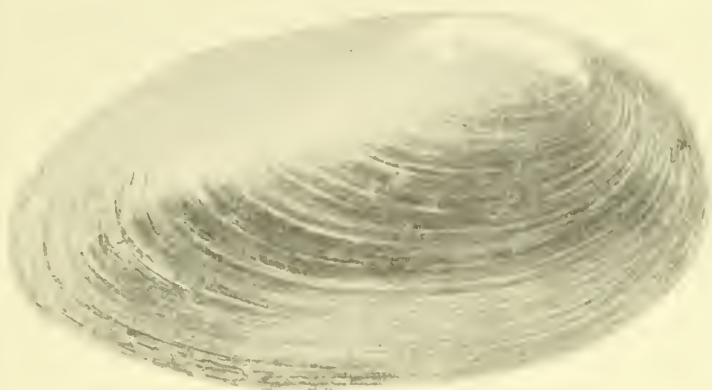
- Fig. 1. *Mycetopoda felipponei*, new species.
2. *Diplodon pilsbryi*, new species.
3. *Mycetopoda felipponei*, new species.

PLATE 4

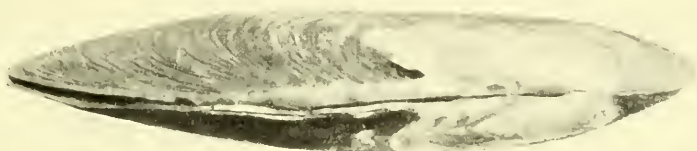
- Figs. 1-3. *Diplodon jacksoni*, new species.
4-6. *Anodontites elfa*, new species.
7-9. *Corbula uruguayensis*, new species (enlarged).
10-12. *Nucula felipponei*, new species (enlarged).
13-15. *Nucula uruguayensis*, new species (enlarged).



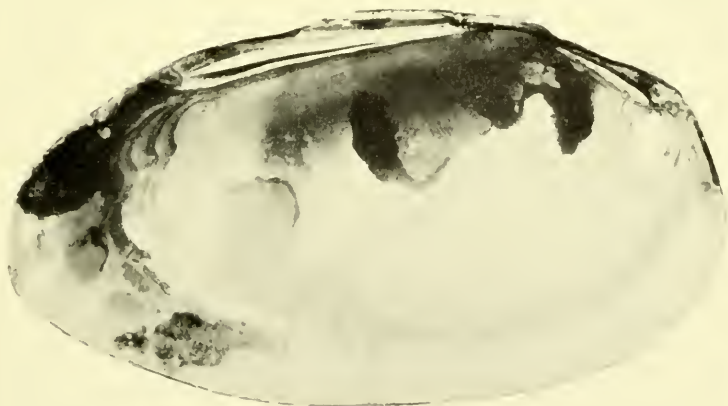




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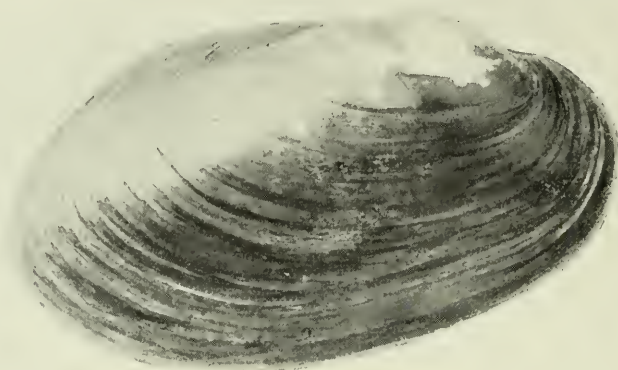
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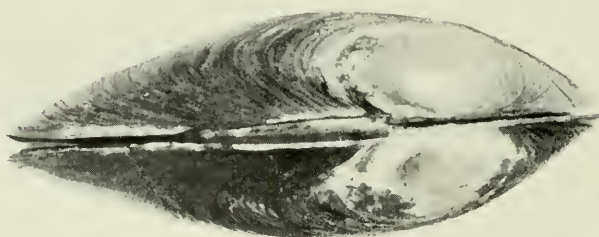
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BIVALVE SHELLS FROM BRAZIL AND URUGUAY

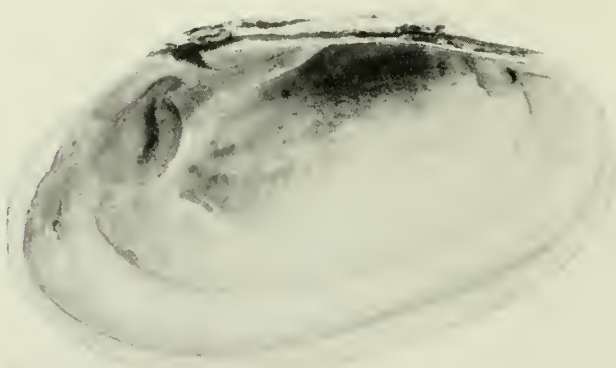
FOR DESCRIPTION OF PLATE SEE PAGE 7



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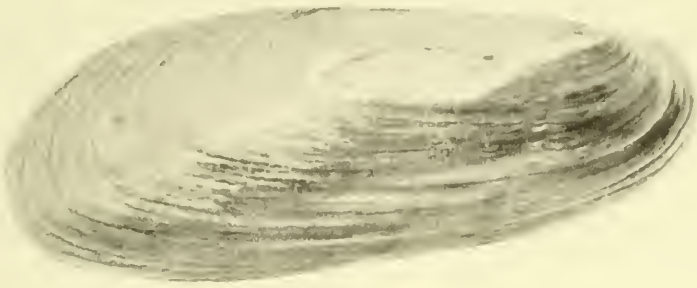
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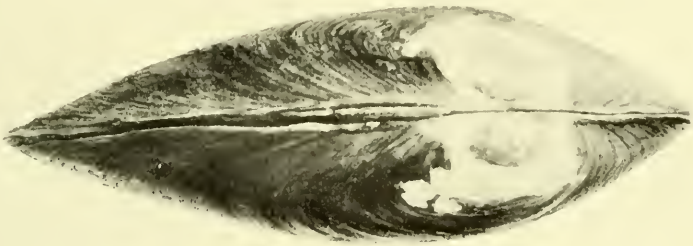
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BIVALVE SHELLS FROM BRAZIL AND URUGUAY

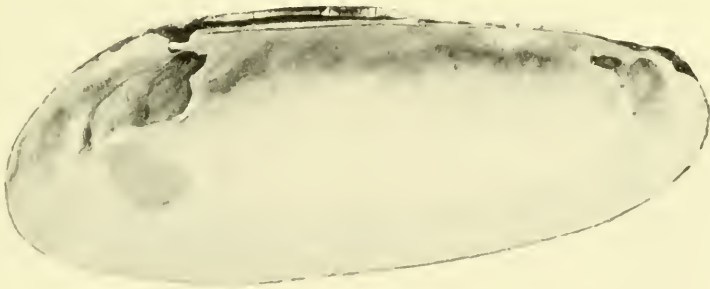
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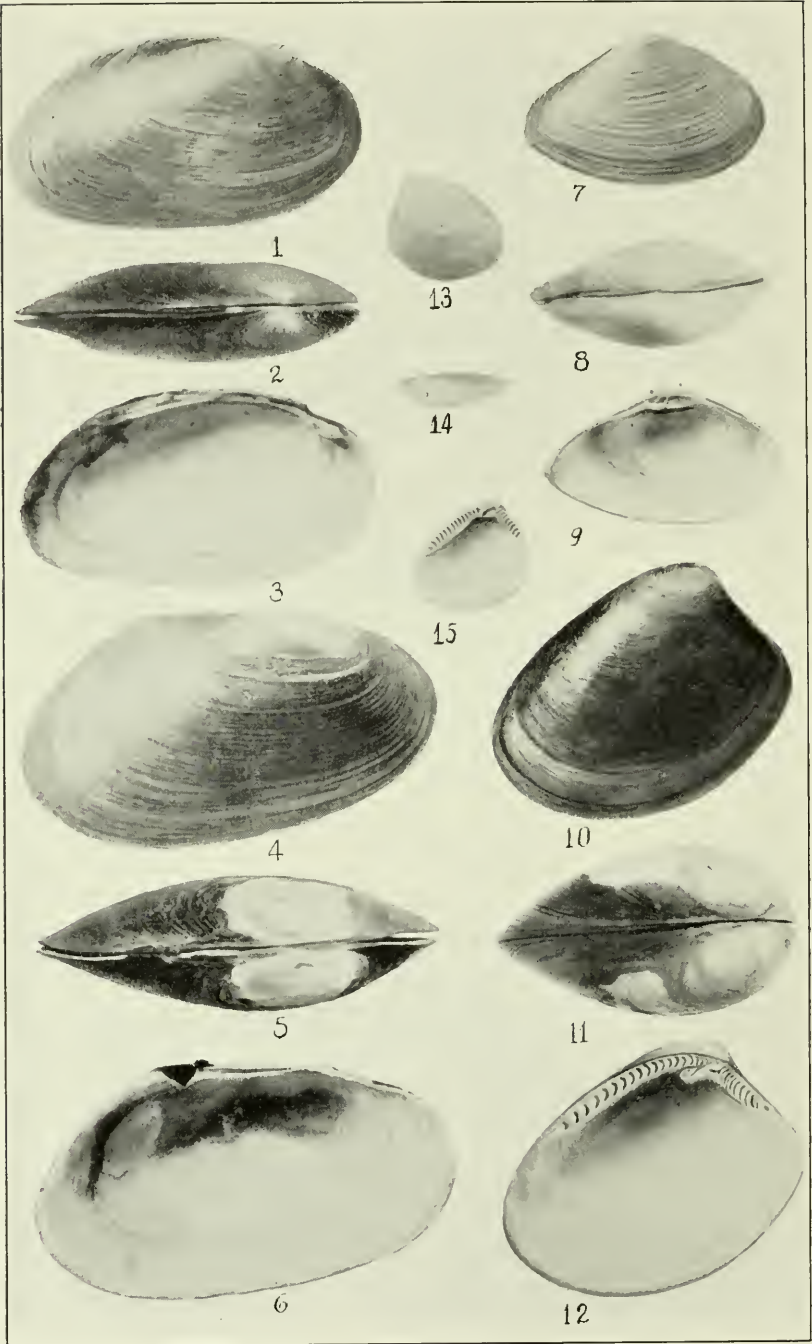
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BIVALVE SHELLS FROM BRAZIL AND URUGUAY

FOR DESCRIPTION OF PLATE SEE PAGE 7



BIVALVE SHELLS FROM BRAZIL AND URUGUAY

FOR DESCRIPTION OF PLATE SEE PAGE 7

BATHMOPTERUS, A NEW FOSSIL GASTEROPOD GENUS FROM THE SILURIAN OF ALASKA

By EDWIN KIRK

Of the United States Geological Survey

In a recent paper published in these Proceedings¹ I briefly discussed an upper Silurian horizon that is widely distributed in Alaska. In the present paper is described a new gasteropod genus from this horizon.

BATHMOPTERUS, new genus

This genus superficially resembles *Euomphalopterus*. This resemblance is due to the general form of the shell and the possession of a broad marginal flange. Here the resemblance ceases, however. *Bathmopterus* has a well defined though nontypical slit band and is apparently referable to the Pleurotomaridae, or possibly the Euomphalidae, rather than the Rhaphistomidae.

The genus is Euomphaloid in general appearance. The spire is low and broadly spreading. Six closely appressed whorls are present in the figured specimen. The umbilicus is very large and open. The upper surface of the whorl is convex. Laterally the whorls are flattened, giving way again to a gently convex area on the under side of the whorl which marks the zone of contact with the succeeding whorl. The inner portion of the whorl is convex and drops off rather abruptly from the contact zone.

The growth lines on the upper surface of the whorls are directed backward to the slit band. Below the band the growth lines are sharply flexed backward in the vicinity of the band. The lines are then carried outward on the broad flange or carina, where from a backward attitude they curve gradually until in the marginal area of the flange they are at right angles, or even directed slightly forward. The growth lines on the under surface of the flange parallel those of the upper surface. The slit band is no more than a flattened area in which the growth lines abruptly change their direction. So far as seen, the band is not sharply delimited by marginal ridges, nor

¹ Proceedings United States National Museum No. 2692, vol. 71, art. 20, pp. 1-9, 1927.

is there a marked change in the growth lines as they cross it. The band is situated above the middle of the whorl. Its lower edge marks the periphery of the whorl, and the band itself lies at an angle on the sloping upper surface of the whorl. The band is flat to slightly convex. As shown by the growth lines, the slit band on the free margin lay at the apex of a deep, sharply angular V-shaped notch. The upper surface of the flange or carina has its inception somewhat below the middle of the whorl and at the base of the flattened lateral zone below the band. Its lower surface seems to be along the line of contact between adjacent whorls. The flange is thick in its inner portion, becoming thinner toward the margin. The flange lies in contact with the upper surface of the infrajacent whorl and in part seems to have coalesced with it. It is only by careful chipping away of this portion of the flange that the upper surface of the whorl can be seen. The flange does not drop down over the slit band but flares abruptly outward at its upper margin.

Bathmopterus may readily be distinguished from *Euomphalopterus* by its wide umbilicus, its deep apertural notch and slit band, and the very different character of its marginal flange. There seems to be no other genus with which *Bathmopterus* may readily be confused, so long as the shell is preserved.

In the Guelph of Ontario are gastropods commonly referred to *Euomphalopterus*. Such material as I have seen is in a very poor state of preservation and can not well be determined with certainty. I think, however, that the Guelph material is not referable to *Euomphalopterus*, and if not referable to *Bathmopterus*, as seems equally probable, represents a new genus.

Type.—*Bathmopterus liratus*, new species, is the type and only known species of the genus. So far as known the genus is restricted to the upper Silurian of Alaska.

BATHMOPTERUS LIRATUS, new species

Plate 1, Figs. 1-5

This species is founded on one excellent specimen and several fragmentary specimens. All the essential structural characters are well shown by the material available for study.

The spire is low, the sides diverging at an angle of about 105° . Measurements give a height of 3 centimeters and a maximum breadth, exclusive of the flange, of 5.5 centimeters. The whorls are closely appressed. In the apical portion of the shell the whorls overlap the preceding whorls to about one-half their height. The fifth whorl is overlapped by the sixth to not more than one-sixth its height. In the intermediate zone there is a progressive change from

one extreme to the other. The largest specimen seen has six whorls, and it is probable that this is near the maximum.

The contours of the whorls are not easily seen owing to the superimposed cover of the marginal flange. The description as given is based in part on cross-sections and in part on whorls from which the flange has been removed. The whorls range from subcircular to subovate in cross-section, the whorl being at times somewhat flattened in the plane of the proximal portion of the marginal flange. The whorls are closely appressed and overlap but slightly. The inner upper margin of the whorl is somewhat flattened along the contact zone with the superjacent whorl. The upper surface of the whorl as far as the band is gently convex. From the lower margin of the band the side of the whorl is nearly perpendicular as far as the flange. Here there is at times a slight evagination of the whorl. Below the flange there is a flattened area marking the contact zone with the next succeeding whorl. The remainder of the whorl is as a rule evenly rounded.

The band, as noted under the description of the genus, is non-typical, in that it does not have bounding carinae and the growth lines in crossing it maintain their relative size and spacing. The band is, however, quite as plainly marked as in some of the *Pleurotomaridac*. The band is wide and lies obliquely on the upper sloping surface of the whorl. The lower margin of the band marks the periphery of the whorl. So far as the specimens available for study show there is no slit.

The growth lines on the upper surface of the whorl are sharply flexed backward to the band, which they cross at right angles. Below the band the growth lines are again sharply flexed backward. On the flange the lines sweep outward in a long smooth curve, in the marginal portion of the flange apparently having a forward direction. On the lower surface of the flange the growth lines parallel the lines on the upper surface. On the whorl itself the lines hold the same direction, but at a less acute angle. As shown by the growth lines a deep V-shaped marginal notch was present, at the apex of which lay the band.

The flange has its inception at about one-third the height of the whorl. At its base the flange is thick, tapering gradually to the outer margin. When followed by another whorl the flange lies directly upon the infrajacent whorl and appears to have coalesced with it. The flange lies in close contact with the whorl below, as far as the upper margin of the band, from which point it is free. In the younger whorls the flange has no free extension, though this may be due to breaking off of the fragile margin during the life of the animal. In the later whorls it extends outward for a considerable distance.

The free portion of the flange near the whorl slopes abruptly downward, then the flange flattens and gradually assumes an upward curve. In extreme cases the flange may turn backward and become partially inrolled.

All the known specimens referable to this species come from the massive upper Silurian limestones of Willoughby Island, Glacier Bay, Southeastern Alaska. Collector, Edwin Kirk.

Cotypes.—The cotypes of *Bathmopterus liratus* are in the collection of the United States National Museum, No. 72671.

EXPLANATION OF PLATE

Figs. 1-5. *Bathmopterus liratus*, new genus and species.

1. Vertical median section through an adult individual.

2-5. Various views of an adult individual. Upper Silurian limestone, Willoughby Island, Glacier Bay, Southeastern Alaska.





A NEW FOSSIL GASTROPOD FROM THE SILURIAN OF ALASKA

FOR EXPLANATION OF PLATE SEE PAGE 4



FURTHER STUDIES OF TYPES OF AMERICAN MUSCOID FLIES IN THE COLLECTION OF THE VIENNA NATURAL HISTORY MUSEUM

By J. M. ALDRICH

Associate Curator, Division of Insects, United States National Museum

The work of classifying the American muscoid flies has been seriously retarded by the impossibility of recognizing many species from the original descriptions, which were written at a time when many important characters had not yet been discovered. For American workers there is the added obstacle that the type specimens are mostly in European museums.

To overcome the difficulty as far as possible the authorities of the Vienna Natural History Museum have generously entrusted to the writer a series of eight shipments of type specimens for study and redescription. The present paper is a report on the latest shipment. The earlier ones were reported in four papers, of which the first three were in the *Annals of the Entomological Society of America*.¹ The fourth paper was published in the *Proceedings of the United States National Museum*; ² it contains a list of all the species included in the first three.

In the present paper the species are numbered consecutively with those already reported.

Genus *ZELIA* Robineau-Desvoidy

Zelia ROBINEAU-DESVOIDY, *Myodaires*, 1830, p. 314.

Leptoda VAN DER WULP, *Tijdsch. v. Ent.*, vol. 28, 1885, p. 196; *Biologia*, Dipt., vol. 2, 1891, p. 250.—BRAUER and BERGENSTAMM, *Zweifl. Kais. Mus.*, pt. 6, 1893, p. 133.—ALDRICH, *Annals Ent. Soc. Amer.*, vol. 18, 1925, p. 123.

Melaleuca VAN DER WULP, *Biologia*, Dipt., vol. 2, 1891, p. 247.—BRAUER and BERGENSTAMM, *Zweifl. Kais. Mus.*, pt. 6, 1893, p. 183.—ALDRICH, *Annals Ent. Soc. Amer.*, vol. 18, 1925, p. 123.

Euzelia TOWNSEND, *Proc. Biol. Soc. Washington*, vol. 28, 1915, p. 23.

The genus *Zelia* originally included several species, of which Coquillett³ designated the first, *rostrata* Robineau-Desvoidy, as type, at the same time stating that it is a synonym of *Dexia vertebrata* Say.

¹ Vol. 17, 1924, pp. 209-218; vol. 18, 1925, pp. 107-150 and 456-469.

² Vol. 72, art. 7, 1927, pp. 1-35.

³ *Proc. U. S. Nat. Mus.*, vol. 37, 1910, p. 621.

The type of *Leptoda* is *Dexia gracilis* Wiedemann, by designation of Van der Wulp, 1891; I examined the type of this species and found it to be identical with *Dexia vertebrata* Say.

The type of *Melaleuca* is *Melaleuca spectabilis* Van der Wulp, the sole species; this appears to be the female of *Dexia vertebrata* Say, which has a considerably different appearance from the male.

The type of *Euzelia* was originally designated as *Zelia wildermuthi* Walton, a species closely congeneric with *vertebrata* Say. The genus was established by the mere designation of a type species, without the mention of any characters.

111. ZELIA POTENS Wiedemann

Dexia potens WIEDEMANN, AUSS. Zweifl., vol 2, 1830, p. 368.

Leptoda potens BRAUER and BERGENSTAMM, Zweifl. Kais. Mus., pt. 5, 1891, p. 406.

Two males, "Brasilien Coll. Winthem," marked as types and agreeing with description. These have a striking resemblance to the males of the well-known *Zelia vertebrata* Say, which occurs widely in the United States and as far south as Brazil. The differences may be briefly stated in place of a lengthy description. *Potens* is much larger, 16 and 18 mm.; the wings are strongly infuscated, especially along the veins; the legs are entirely black, the femora (one specimen) yellowish-red on basal half. The second and third abdominal segments are elongated and mostly transparent, even more so than in *vertebrata*. The epistoma is more prominent and the third antennal joint a little more slender. The female of this species, judging by our northern form, must be very different in appearance, and I am of the opinion that it will turn out to be the species *phaeoptera* Wiedemann. The very different abdomen in the female would at first sight make this look improbable, but the thoracic pattern, wings, legs, and head agree remarkably well. Only careful collecting in the region where the species occurs can definitely settle this question.

112. ZELIA PHAEOPTERA Wiedemann

Dexia phaeoptera WIEDEMANN, AUSS. Zweifl., vol. 2, 1830, p. 370.

Leptoda phaeoptera BRAUER and BERGENSTAMM, Zweifl. Kais. Mus., pt. 5, 1891, p. 406 (gen. ref.).

Two females, "Brasilien, Coll. Winthem," marked as types and agreeing with description; a third female agreeing, but not marked as type, is retained for the National Museum, as we did not have the species. It is labeled "Natt. Bras." They go well in the genus *Zelia* Robineau-Desvoidy, differing from the type, *vertebrata* Say, mainly in having the epistoma considerably more protuberant.

Female.—Front 0.29 of head width at vertex, widening considerably on the upper part, more gradually below; parafrontal, para-

facial and cheek with dense grayish-white pollen slightly tinged with yellow above. The parafrontals bare except for a few small hairs above, each a little wider than the dark brown middle stripe on the upper part. Frontal bristles only about six, reaching the base of antennae; two large proclinate orbitals and one reclinate above them not distinctly connected with the frontal row; ocellars large, proclinate and divergent. Front not prominent, the antennal axis only as long as the vibrissal; cheek nearly half the eye height, with a reddish streak from the eye to the mouth, back of which are a few small black hairs. Vibrissae a little above the oral margin, with several rather large bristles below them and a few small bristles immediately above; facial ridges bare. Antennae dark red, third joint narrow, about four times the second, with long-plumose arista; second joint with a long curved bristle over the arista; palpi yellow, of ordinary size, proboscis also ordinary. Back of head with rather sparse hair which is dark except close to the neck; parafacial almost equalling in width the entire clypeus. Thorax with dense grayish-yellow pollen and four black stripes, the two inner narrow in front. Scutellum black at base, the rest densely yellowish-gray pollinose. Chaetotaxy: Acrostichal 1 or 2, 2; dorsocentral 3, 4; humeral 3; posthumeral 2 or 3; presutural 1; notopleural 2; supraalar 3; intraalar 3 (the two anterior small); postalar 2; scutellum with two pairs of laterals and one equally large apical, and one pair of discals. Sternopleural 2, 1; post-scutellum well developed, with yellow pollen. Calyters of ordinary size.

Abdomen with the first three segments velvety brownish-black, the basal third or more of the second and third segments more shining and with a trace of thin, white pruinosity, not tessellated; fourth segment red, slightly blackish in the middle above, the sides densely yellowish pollinose to the venter, but the pollen does not include the posterior part where the bristles arise. First abdominal segment without median marginals, second with one pair, third with a marginal row, the middle two pairs stout, fourth with a marginal row somewhat smaller, no discals on any of the segments. Legs black, front tibia with one outer bristle, mid tibia with two on outer front side, two on outer hind side, and one flexor. Hind tibia with three on outer hind side, two on inner hind, one on outer front. Wing densely infuscated along the middle and costa, paler behind and in the larger cells. Fourth vein beyond the cross vein bent a little back toward the hind margin, the angle slightly acute, with a short but distinct appendage, thence with a little concavity to the margin distinctly before the apex. First vein bare, third with four or five bristles at base.

Length, 11 and 13 mm.

113. *ZELIA ATRIFRONS* Wiedemann

Musca atrifrons WIEDEMANN, AUSS. Zweifl., vol. 2, 1830, p. 403.

Leptoda atrifrons BRAUER and BERGENSTAMM, Zweifl. Kais. Mus., pt. 5, 1891, p. 406.—ALDRICH, Cat. N. A. Dipt., 1905, p. 505.

The species was originally described from a single female specimen without locality. This specimen, labeled *Leptoda atrifrons* and agreeing with Wiedemann's description, has been received for study. Brauer and Bergenstamm⁴ assert that Bigot's *Tromodesia haemorrhoidalis* from Mexico⁵ is a synonym of *atrifrons*, from the type. Bigot's description is very brief and superficial, but the same type was redescribed by Van der Wulp;⁶ the specimen was evidently a male, though taken for a female by Van der Wulp. Whatever this species may be, I am satisfied it can not be *atrifrons* Wiedemann. It was placed in *Leptoda* by Brauer and Bergenstamm.⁷

Female.—Head at vertex 0.27 of head width, widening a little, then more slowly, toward the antennae, which are attached at about the level of the lowest fourth of the eye; the face flat and strongly receding, about half as long as the front. Vibrissae at oral margin; frontal stripe velvety, almost black, narrower than one parafrontal even at the upper end. Inner verticals large and reclinate; outer but little larger than the cilia behind the eye. Ocellars divaricate, hardly more than hairs. Frontals about 10, the lowest distinctly above the antennae, one upper reclinate and divergent at level of anterior ocellus, much nearer the eye than the remainder; the usual two pairs of orbitals present. The parafrontal and parafacial are broad, densely covered with smooth silvery white pollen, entirely bare except a few minute hairs close to vertex and one or two between the upper and lower orbital. Antennae yellow, as long as the face, the third joint less than twice the second, slightly swollen toward apex; second joint without unusual pile. Arista rather short-plumose almost to tip. Palpi yellow, of ordinary size; proboscis short; cheek one-third the eye height, with dark hairs on posterior part. Back of head flat, the vibrissal axis about three-fourths the antennal. Thorax black with dense whitish pollen, stripes not very prominent. Sternopleural 2, 1; scutellum entirely black, with two lateral bristles, a rather large decussate apical pair and a small sloping discal pair. Calypters white, no infrascapular spinules. Post-scutellum and hypopleural bristles well developed.

Abdomen mostly shining dark reddish, the first segment black, the following two black along the middle of the dorsum almost to the tip of the third. Second and third segments with narrow sharply

⁴ 1893, p. 183.

⁵ Annales Soc. Ent. France, 1889, p. 267.

⁶ Biologia, Dipt., vol. 2, 1891, p. 238.

⁷ 1893, p. 138.

defined basal silvery crossbands widening on the venter where the first is also pollinose. Fourth segment entirely red in ground color without basal crossband, but showing considerable silvery pollen below precisely as described by Wiedemann.

Legs, reddish-brown; front tibia with one outer bristle. Middle tibia with one on outer front side, two on outer hind side, and one flexor. Hind tibia with a series of four of increasing length on the outer hind side to the middle and several smaller in the same row, three on inner hind side, the last about the middle. Wings hyaline, bend of fourth vein nearly rectangular, the cross vein concave and ending a little before the tip, the apical cell rather widely open.

Length, 7 mm.

Not represented in the United States National Museum.

In several characters this species resembles *Metadexia tricolor* Coquillett, but has the first vein bare.

114. *ZELIA LIMBATA* Wiedemann

Dexia limbata WIEDEMANN, AUSS. Zweifl., vol. 2, 1830, p. 371.

Leptoda limbata BRAUER and BERGENSTAMM, Zweifl. Kais. Mus., pt. 5, 1891, p. 406 (gen. ref.).

One female labeled as type and agreeing with Wiedemann's description, especially in the front, which is golden pollinose on the upper half, changing abruptly at the middle to cinereous. The locality is "Brasilien."

The specimen is a *Zelia* and very similar to *Zelia vertebrata* Say, which is common enough in North America to be taken as a basis of comparison. In *limbata* the most striking difference is in the color of the front, already noted. Ocellars minute, proclinate, and widely divergent; antennae red, third joint four times the second. Arista with long, loose plumosity; scutellum with two laterals and a large apical decussate pair. Abdomen with wide median black stripe narrowly interrupted at base of segments, expanding behind to embrace the segment at its apical two-fifths, wider at sides; the pollinose area of second segment yellow in ground color; fourth segment red on apical third or more. No discals on any segment, a median marginal pair on second, a marginal row on third and fourth. Femora reddish on basal half or more; mid tibia with two bristles on outer front side. Wings subhyaline, but the veins broadly bordered with brown; bend of fourth vein rectangular with distinct, short appendage (probably not specific); third vein with a few hairs. Epistoma not more prominent than in *vertebrata*.

Length, 11 mm.

Not represented in the United States National Museum.

115. *ZELIA PLUMOSA* Wiedemann

Devia plumosa WIEDEMANN, AUSS. Zweifl., vol. 2, 1830, p. 370.—MACQUART, Dipt. Exot., 3d Suppl., p. 213 (sep. 53).—BIGOT, in Sagra's Hist. etc., de l'Isle de Cuba, 1857, p. 815.

Leptoda plumosa BRAUER and BERGENSTAMM, Zweifl. Kais. Mus., pt. 5, 1891, p. 102 (gen. ref.).

One female, "Brasilien, Coll. Winthem," which has lost the antennæ, palpi, and all of the legs except one front femur. Except as to sex it agrees with Wiedemann's description, and also bears the small red tag of Wiedemann's type material.⁸ I do not doubt that this is one of the types.

Pollen of head pale yellow, more silvery on cheek and parafacial, the yellow a little deeper on the middle of the front. Vertex slightly blackish. Width of front at vertex 0.29 of head width, the eyes diverging uniformly to their lowest curve. Frontal stripe dark brown, slightly narrower than the parafrontal, the usual orbital bristles present. Parafacial wide, bare, nearly as wide as the clypeus, which has a very low and indistinct carina above. Epistoma rather strongly projecting. Cheek with four or five bristles next to edge of mouth, above this almost entirely bare. Beard white except its anterior portion, which is black along the ridge extending from the posterior orbit to the mouth. Proboscis small. Thorax gray pollinose, dorsum with four distinct black stripes in front, the inner narrow and extending a little behind the suture, where they disappear and are replaced by a median stripe, also narrow, extending to the scutellum; the outer stripes are as usual interrupted at the suture and abbreviated before and behind. Acrostichal 2, 3; dorsocentral 3, 4; humeral 4; posthumeral 3; presutural 1; notopleural 2; supraalar 3; intraalar 3; postalar 2; sternopleural 2, 1; scutellum with 2 lateral, one large apical and one fairly large discal pair.

Abdomen black with slight reddish tinge along the sides and more distinctly at apex. The pollen seems to have a rather characteristic pattern, as mentioned by Wiedemann. It is partially tessellated or changeable, and on the second segment there is a large triangle, rather opaque black in all directions, its apex just about reaching the front edge, the base reaching the tip of the segment, and extending narrowly toward the sides. The third segment is a little rubbed, but apparently had a similar triangle, and more broadly extended along the hind edge. The rather thin, almost silvery pollen of the remainder of the second and third segments becomes still thinner along the sides, more dense on the venter. First segment with only a lateral pair of bristles, second with a large median marginal pair and

⁸ Brauer, Zweifl. Kais. Mus., pt. 1, 1880, p. 105.

one lateral pair; third with a marginal row of about 18 on the entire tergite, extending to the center underneath. The last segment with similar row, about 12; no discal bristles.

Legs black.

Wing rather dark brown on basal third or more and along the costa, the larger cells behind considerably lighter in the middle; fourth vein with rectangular bend, not at all rounded, thence rather evenly concave to the costa, considerably before the tip of the wing; third vein with four or five hairs at base.

Length, 12 mm.

Not represented in the United States National Museum.

Genus *TELOTHYRIA* Van der Wulp

Telothyria VAN DER WULP, *Biologia*, Dipt., vol. 2, 1890, p. 167.—BRAUER and BERGENSTAMM, *Zweifel. Kais. Mus.*, pt. 5, 1891, p. 377; pt. 6, 1893, p. 132.—TOWNSEND, *Rev. Mus. Paul.*, vol. 15, 1926, p. 210.

Therevops BRAUER and BERGENSTAMM, *Zweifel. Kais. Mus.*, pt. 5, 1891, p. 378; pt. 6, 1893, p. 132.—TOWNSEND, *Rev. Mus. Paul.*, vol. 15, 1926, p. 211.

Originally included in *Telothyria* were 38 species, a very heterogeneous group; Brauer and Bergenstamm designated *cupreiventris* Van der Wulp as type in 1893. In the same place they designated *Miltogramma brevipennis* Schiner as the type of *Therevops*, which originally included this and *cupreiventris*. No characters for the separation of the two genera were given. A male of *cupreiventris* is in the National Museum from Porto Bello, Panama (Busck), determined by Townsend. This is clearly congeneric with *brevipennis* Schiner, noted below. In Townsend's key (1926 above), the only difference given is that the posterior crossvein joins the fourth vein somewhat nearer the bend in *Telothyria*. The opposite is the case, as I find in the specimens that in *brevipennis* it joins the fourth vein at two-thirds, in *cupreiventris* at three-fifths, of the distance from the small crossvein to the bend. The principal difference between the two species is that in *brevipennis* the mesonotum is covered with the characteristic pale branched hairs, while in *cupreiventris* these are restricted to the pleurae, the dorsum having black hair and a rather dense glaucous pruinosity.

116. *TELOTHYRIA BREVIPENNIS* Schiner

Miltogramma brevipennis SCHINER, *Novara Reise*, 1868, p. 324.

Therevops brevipennis BRAUER and BERGENSTAMM, *Zweifel. Kais. Mus.*, pt. 5, 1891, p. 378; pt. 6, 1893, p. 132.

Schiner described *brevipennis* from a single male, which has been received for study. The label is "Novara R. Brasilia," and it is also labeled as type of *brevipennis*. It agrees with Schiner's description, but the third antennal joint is a little longer than his estimate.

Male.—Front 0.22 of head width at vertex, almost the same at base of antennae, thence widening quite rapidly. Cheek one-seventh of eye height, wider posteriorly as the edge of the oral cavity slopes upward toward epistoma. Vibrissae at oral margin, above the level of lower curve of eye. Vibrissal axis equal to antennal, the antennae attached above the level of eye middle, no ocellars; one pair of verticals; frontals about 13, rather small, extending to level of middle of second antennal joint. Antennae small, reaching hardly halfway to vibrissae, third joint twice the second. Arista subplumose on basal third, apical half or more bare. Pollen of head pale yellow (probably faded) parafacials white; hairs of parafrontal and cheek white, delicate. Antennae reddish, tip of third joint infuscated. Palpi slender, yellow, not abbreviated; proboscis small, slender.

Thorax black in ground color, pleurae with dense covering of white plumose hairs which replace the hypopleural bristles and extend upon the coxae; there are two stout black sternopleurals. Mesonotum covered with similar but shorter plumose hairs, the scutellum, however, has none except at the sides and there they extend along the lower edge nearly to the tip. The black bristles of the mesonotum are conspicuous, as follows: Acrostichal 4, 4; dorso-central 3, 3; humeral 4; posthumeral 1 (and 1 at front edge, interhumeral); presutural 1; supraalar 2; intraalar 2; notopleural 2 (?); scutellum with 2 large lateral, a very minute apical, the disk with coarse black hair. Calypters large, bare, nearly white.

Abdomen brownish-yellow, the ground color quite uniform, the segments covered with thin whitish pollen uniformly distributed; in some lights, a denser white crossband at base of second, third, and fourth segments; all the sternites wholly covered; lateral margins of second and third segments with one large bristle each, no others on second, third with a pair of very faintly developed marginals hardly larger than adjacent hairs; fourth with a marginal row (broken off). Genital segments minute, retracted.

Legs brownish-black, in some lights a little paler; front pulvilli not enlarged; mid tibia with one bristle on outer front side, hind with fine, appressed ciliation on outer hind side and one large on outer front.

Wings subhyaline, shorter than abdomen; fourth vein with rounded, oblique bend; thence barely concave, ending a little before apex; first posterior cell open; third vein with one distinct hair at base, first vein bare; the costal segment before the second vein equal to that beyond it; hind cross vein oblique, almost straight, joining fourth at two-thirds the distance from small cross vein to bend.

Length, 10 mm.

Not represented in the United States National Museum, although we have several specimens rather close to it. The group appears to be a difficult one, and the females probably differ from the males in some of the characters. Another male from the Vienna Museum, labeled "Novara R. Brasilia," the same as the type, but not mentioned by Schiner, is also labeled "brevipennis"; it has the same characters except that the antennae are wholly yellow, the scutellum has a mixture of pale and black hairs, the abdomen has an indistinct median dark stripe, its third segment has two pairs of large marginals (scars), the legs are decidedly yellow, and the middle tibia has two bristles on outer front side. Another male, "Natt. Bras.," agrees with the last, as do two more labeled simply "S. America." All of these are labeled "brevipennis," but disagree with Schiner's description in having well-developed median marginals on the third segment, so there is no doubt as to which specimen is the type.

117. STOMATODEXIA COTHURNATA Wiedemann

Stomoxys cothurnata WIEDEMANN, AUSS. Zweifl., vol. 2, 1830, p. 249.

Stomatodexia cothurnata BRAUER and BERGENSTAMM, Zweifl. Kais. Mus., pt. 4, 1889, Fig. 195; pt. 6, 1893, p. 133.—VAN DER WULP, Biologia, Dipt., vol. 2, 1891, p. 239.—GIGLIO-TOS, Mem. R. Acad. Sci. Torino, ser. 2, vol. 45, 1895, p. 64.

Eight specimens, all males, were received, each of which is separately labeled *cothurnata*. Two of these are labeled type and two more have old identifications. All of these four agree with the description and may be considered the original type series. They are from "Brasilien." The other four, although "det. B. B.," are quite different and belong to two species. The species is the genotype of *Stomatodexia*.

Male.—Front very narrow, only 0.09 of head width at vertex, continuing in about the same width nearly to antennae; in profile the front becomes a little prominent at the antennae, which are at a level with the middle of the eye. Face in profile rather deeply concave a little below the middle. Vibrissal axis equal to antennal; cheek about one-fifth the eye height; parafacial very narrow, only one-third the width of third antennal joint. Ocellar bristles proclinate, parallel, of the same size as the frontals; vertical bristles hairlike. The whole head except the back is pale in ground color with light yellow pollen, more whitish on face; epistoma brown. Antennae pale yellow, the third joint slender, more than twice the second. Arista with longer plumosity than in most of the related forms, the longest hairs being about equal to the width of the third antennal joint. There are only two small black hairs below the vibrissae; even these are absent in one specimen. Proboscis slender, with minute erect setules, projecting forward from the epistoma

to a distance equal to the vibrissal axis. Palpi a little elongated and slender, not clavate.

Thorax yellow in ground color except the median part of the mesonotum. The best preserved specimen shows the following chaetotaxy: Acrostichal 1,0; dorsocentral 2,2; humeral 2; post-humeral 1; presutural 1; notopleural 2 (the posterior hairlike); supraalar 2 (posterior hairlike); intraalar 2; postalar 1; scutellum with only two pairs of laterals, no apical or discal; sternopleural 2,1.

Abdomen very slender, the first segment entirely yellow, the second with a lateral black spot on each side at the hind edge, and one above including the median marginal bristles; third and fourth segments narrowly bordered with black behind, in one specimen the dark markings extend forward on the middle of the dorsum of the second and third segments and there are three minute spots on the hind edge of the first segment. First abdominal segment with no median marginals, one pair of lateral marginals and two or three smaller bristles before the latter. Second segment with one pair lateral; third and fourth segments with a marginal row of about six. The genital segments are small, entirely yellow, the inner forceps yellow, combined into a minute, sharp point turned a little backward; the outer forceps are also entirely yellow, considerably elongated, stout at base, the slender apex curving inward and backward.

Legs yellow, the hind femora very slightly infuscated toward the tip, the hind tibiae more or less infuscated; the tarsi brown, front ones paler at base; all the tarsi are decidedly elongated, much longer than their tibiae. The front tibiae and tarsi measure 52 and 99 micrometer units respectively, the latter including 9 for pulvilli. All the claws and pulvilli much elongated.

Wings slightly brownish, long and narrow, the costa with unusually coarse and rough looking hairs as far as the end of the first vein; fourth vein with a long, oblique curve at the bend, toward the tip a little concave, ending just before the apex; first posterior cell rather narrowly open, but its apex not abruptly narrowed. First vein bare, second with about three bristles at base. Calypters light brown, translucent.

Length, 8-8.5 mm.

A badly preserved male from Tabasco, Mexico, in the United States National Museum collection, was identified as *cothurnata* by Townsend. It agrees very well with the type as far as can be judged except that the costa has only the ordinary smooth setules. No females have been seen which could be definitely associated with *cothurnata*. One of the type males is retained by permission of the Vienna museum.

118. STOMATODEXIA BIBENS Wiedemann

Stomoxys bibens WIEDEMANN, AUSS. Zweifl., vol. 2, 1830, p. 249.

Stomatodexia bibens BRAUER and BERGENSTAMM, Zweifl. Kais. Mus., pt. 5, 1891, p. 102 (gen. ref.).

One female, "Brasilien, Coll. Winthem," with small, red tag of Wiedemann type and so labeled. Wiedemann's description deals with some characters which are not well preserved now, but there are no serious discrepancies and the specimen may be accepted as the type. It is of robust build like *Eumyobia flava* Townsend (female type), *Trochiloleskia flava* Townsend (female paratype), and *Stomatodexia similigena* Van der Wulp (females determined by Bezzi). The males of none of these are in the collection, but they are probably of more slender proportions. The location of the present species in *Stomatodexia* is provisional, as it has a shorter and stouter proboscis than that of *cothurnata* Wiedeman, type of the genus, and is much unlike the slender males of that species in appearance.

Female.—Vertex 0.26 of head width, widening considerably in a short distance, the eyes then diverging gradually to their lower curvature. Ocellar bristles represented only by a cluster of hairs. Frontals extending to base of second antennal joint, the usual two orbitals present. Parafrontals and parafacials broad, the former considerably wider than the middle stripe, the latter about twice as wide as the third antennal joint. Cheek one-third of eye height. Epistoma strongly projecting so that the face is deeply concave in profile in its lower part. Vibrissae a little above the oral margin, the vibrissal axis of the head equal to the antennal axis. Proboscis from the elbow barely equal to head height; palpi about three-fifths as long, slender, with a rather striking black hair below at tip and several smaller toward the base. Antennae reddish-yellow, the third joint rather distinctly infuscated from about the middle. Arista with rather short plumosity, the longest hairs about two-thirds as long as the width of the third antennal joint. Beard very pale yellow, only a single thin row of about six small black bristles along edge of mouth. Pollen of parafrontals, parafacials, and posterior orbit white with a slight tinge of yellow.

Thorax yellow, except on the dorsum, which is considerably damaged; humeri and sides of dorsum yellow, as well as the scutellum. Sternopleural 2, 1; scutellum with two lateral pairs and one discal pair; no apicals. Calypters almost white, translucent.

Abdomen reddish yellow, the first segment with a black spot under the tip of the scutellum, the second segment with a large, poorly defined, black triangle nearly reaching the front border, not quite connected on the hind edge with a lateral mark which runs down on the venter. Third segment damaged, but with considerably larger

black mark extending to the side and underneath along the hind edge, and barely reaching the front edge in a considerable width; fourth segment damaged but apparently black on the anterior half in the middle part. First segment without marginals, the second slightly abnormal but showing one marginal. The third with a row of six, fourth with a row of six or eight somewhat smaller; no discals.

Legs yellow, with black tarsi which are considerably elongated for a female. Pulvilli small; middle tibia with one bristle on outer front side (a small second above it on one side).

Wing of ordinary form, the fourth vein with an oblique curve, slightly concave near the tip, so that the first posterior cell is open a little before the apex and the third and fourth veins are almost parallel where they reach the costa. First vein bare, second with about four bristles.

Length, 9 mm.

Not represented in the United States National Museum.

119. *LESKIOPALPUS FAMELICUS* Wiedemann

Stomoxys famelica WIEDEMANN, AUSS. Zweifl., vol. 2, 1830, p. 250.

Stomatodexia famelica BRAUER and BERGENSTAMM, Zweifl. Kais. Mus., pt. 5, 1891, p. 102 (gen. ref.).

One female, "Brasilien, Coll. Winthem," labeled as type and agreeing with Wiedemann's description. Wiedemann indicates that he had several specimens, but this was apparently one of them. On account of the short proboscis I put it in *Leskiopalpus* instead of *Stomatodexia*, but it has longer palpi than any other species of the genus. One female in the United States National Museum from Cayuga, Guatemala (William Schaus), agrees with the type.

Female.—Front 0.26 of head width, not widening perceptibly to the antennae, the face only a little wider. Vibrissal axis equal to antennal; cheek about one-fifth the eye height; parafacial as wide as third antennal joint, the usual orbital bristles present. Frontals reaching base of second antennal joint. Antennae red to the arista, the remainder black; third joint three times the second; arista short-plumose; proboscis from elbow less than head height; palpi long and clavate, just reaching tip of proboscis when the latter is retracted: no ocellar bristles; dorsum of thorax black, yellow along sides and scutellum yellow to base, the latter with only two pairs of lateral bristles, no apicals.

Abdomen yellow, translucent, shining, with a black median triangle at apex of second segment, third with similar triangle and a black lateral spot; fourth with slight indistinct black markings at sides and around bases of bristles; second segment with one pair of median marginals; third with a marginal row of six; fourth with a submarginal row of about the same.

Legs yellow.

Wing slightly infuscated; fourth vein with rounded and oblique bend, thence slightly concave, ending barely before the apex; third vein with two to four hairs at base, first vein bare. Calypters pale yellow.

Length, 8 mm.

120. *GENEA MACULIVENTRIS* Rondani

Genea maculiventris RONDANI, Nuovi An. Sci. Nat., Bologna, ser. 3, vol. 2, 1850, p. 172.—BRAUER and BERGENSTAMM, Zweifl. Kais. Mus., pt. 6, 1893, p. 132.—ALDRICH, Ent. News, vol. 25, 1924, p. 210.

One male labeled *Spathipalpus maculiventris*, from Bahia. This is not a type, but agrees perfectly with Rondani's excellent description, quoted by me in the reference above. As there stated, I think *Spathipalpus* Rondani is an entirely different genus. The United States National Museum still contains only the single female of *maculiventris* that was mentioned by me. As compared with the Vienna male, the former has the palpi decidedly more clavate; in the latter they are of uniform diameter, very slender, projecting forward beyond the epistoma to a distance equal to fully three-fourths the vibrissal axis of the head; they reach almost to the middle of the exposed part of the proboscis when it is directed forward as in this specimen. The proboscis, except at base, is covered with minute erect hairs. The ocellars are minute, in the female spreading almost laterally, in the male somewhat more proclinate. The male has no orbitals, a point left a little in doubt by Rondani's statement that there are two rows of frontals. He evidently included both sides.

Length of male, 6.3 mm; of female, 7 mm; Rondani gives 7 mm.

Genus *CHOLOMYIA* Bigot

Cholomyia BIGOT, Bull. Soc. Ent. France, 1884, p. 42.—VAN DER WULP, Biologia, Dipt., vol. 2, 1891, p. 246.—BRAUER and BERGENSTAMM, Zweifl. Kais. Mus., pt. 5, 1891, p. 375, note.—ADAMS, in Williston's Manual, 1908, p. 356.

The type species is *inaequipes* Bigot, new, equals *Musca longipes* Fabricius preoccupied.

121. *CHOLOMYIA INAEQUIPES* Bigot

Musca longipes FABRICIUS, Syst. Antl., 1805, p. 298 (preoc. Scopoli, Ent. Carn., 1763, p. 336).

Dexia longipes WIEDEMANN, Auss. Zweifl., vol. 2, 1830, p. 379.

Cholomyia longipes JOHNSON, Psyche, vol. 19, 1912, p. 102.—BROOKS, U. S. Dept. Agr. Bull. No. 1066, 1922, pp. 7, 11, 13, 16, rearing records.

Cholomyia inaequipes BIGOT, Bull. Soc. Ent. France, 1884, p. 42.—VAN DER WULP, Biologia, Dipt., vol. 2, 1891, p. 247, pl. 6, Fig. 12.—TOWNSEND, Muscoid Flies, 1908, p. 66, rearing record.—JOHNSON, List Dipt. New Eng., 1925, p. 209.

Thelairodes basalis GIGLIO-TOS, Boll. R. Univ. Torino, vol. 8, No. 147, p. 3; Ditteri del Mess., pt. 3, 1894, p. 65.

Four males received; two (Brazilien, Coll. Winthem) are identified as *longipes* Wiedemann, one (Mexico, Bilimeck) as *inaequipes* Bigot, and one (Brasilia, Alte Sammlung) unidentified. These all agree with each other and with Wiedemann's description, though none are labeled type. They also agree with the description of *inaequipes* except for the infuscation of the femora and tibiae and a slight discrepancy in Bigot's description of the dark color of the third and fourth abdominal segments. Giglio-Tos's description is of a female and agrees exactly with our only tropical female in the United States National Museum from Vera Cruz.

Male.—Front at narrowest about as wide as the distance between the posterior ocelli, widening considerably and uniformly to the lower curve of the eye. Ocellars large, proclinate, not divergent. A small pair of post-ocellars directed forward; frontals beginning below the narrowest part, six or seven in number hardly reaching base of antennae. Parafrontal widening rapidly to the parafacial which is considerably wider than the third antenal joint and bears perceptible minute hairs, mostly dark. Face flat, without keel, slightly receding. The vibrissae considerably above the lower edge of the head, but not approximated; edge of the mouth with only two or three small black bristles; cheek more than one-third the eye height. Transverse impression brownish, rather large. Antennae entirely yellow, third joint rather slender, more than three times the second. Arista rather short, densely plumose to tip. Palpi yellow, of normal size; proboscis small. Thorax with pale yellow, almost silvery dense pollen to the suture when viewed directly from behind; this sometimes seems to extend to the scutellum, but in a rear view the portion behind the suture is dark brown. Scutellum black with thin brown pollen; pleura with a silvery stripe from the notopleural suture down across the sternopleura. Chaetotaxy: Acrostichal 2, 1; dorsocentral 2, 3; humeral 2; posthumeral 1; presutural 1; notopleural 2; supraalar 1 (and a large hair just behind it); intraalar 1; postalar 2; sternopleural 1, 1; scutellum with two large marginal, a long apical decussate pair and a small discal; postscutellum well developed. Posterior calypter quite large, almost transparent but with a slight brown tinge; infraquamal setules very distinct, about a dozen.

Abdomen translucent yellow, the posterior third of the second segment with a dark shade; third segment black on about the posterior two-fifths which extends forward on the dorsum to the middle or more; fourth segment wholly black, with silvery pollen all the way round except at tip, but thinner on the dorsum; no discal bristles even on the fourth segment. First without marginals, second with a small pair, third with a row of four rather large, fourth with a row of six.

Legs yellow; middle and hind femora, and sometimes the front ones, infuscated on the apical third or more; middle and hind tibiae decidedly infuscated; all the tarsi black, the middle femora approximately twice as long as the hind ones, longer than the entire head and body of the insect; their tibiae are only a little shorter and the tarsi are also much elongated, about equal to the femur. The length of the middle legs is subject to some variation. The front and hind legs are moderately elongated, with long tarsi. Front pulvilli much elongated, the others less so.

Wings distinctly and rather evenly infuscated, the fourth vein with an oblique rounded bend, thence slightly concave, ending barely before the extreme tip of the wing. The apical cell rather narrowly open. The wing is considerably elongated and narrowed, but not so much so as in some related species. There is no costal spine; the third vein has several hairs at base, sometimes extending halfway to the cross vein. The first vein is distinctly hairy on the apical part, beginning where the auxiliary vein diverges from it; the basal portion frequently shows two or three scattered hairs, rarely more.

Length, 7 mm.

Female.—Body, legs, and wings all much shorter than in male, head rounder, the front 0.26 of head width; third antennal joint infuscated from near the base. Front legs entirely yellow, except tarsi; middle and hind femora with a trace of infuscation and their tibiae rather distinctly brown. Tarsi black. Wings as in the male, but shorter and broader. Abdomen yellow at base, the black occupying all of the third and fourth segments and about half of the second, in the middle extending forward almost to the first. The second, third, and fourth segments with broad silvery crossbands at base.

Length, 6 mm.

The description of the male is drawn from the Brazilian specimens, that of the female from a specimen in the United States National Museum collected at San Rafael, Vera Cruz, by C. H. T. Townsend; the National Museum has three additional males from the Tropics, from Frontera, Tabasco (Townsend); Cayuga, Guatemala (Schaus and Barnes); and Higuito, San Mateo, Costa Rica (Pablo Schild). Our only tropical female is the one described above.

The United States National Museum also contains specimens from the United States which are apparently of the same species. Four of these were reared at French Creek, W. Va., by F. E. Brooks, as parasites of the species of the weevil genus *Balaninus*. One is from Mound, La., reared in 1897 from *Conotrachelus juglandis*. Other specimens are from Washington, D. C.; Peaks of Otter, Va.; Lexington, Ky.; Lawrence, Kans.; La Fayette, Ind.; and Dawson Camp, Salt River, Ariz.; collectors being R. C. Shannon, J. M. Aldrich, Wil-

liam Palmer, and C. H. T. Townsend. In all, 23 specimens, of which only six are males. None of these northern specimens have hairs on the first vein except on the apical part, where they are very constant. The males have the femora and tibiae yellow in most cases, although sometimes with slight infuscation. Wishing to ascertain beyond question whether the variations observed could have any specific significance I asked C. W. Johnson to look over his tropical material. From his notes and a careful study of our material I believe we are safe in regarding the northern form as belonging to the same species. The color of the legs shows some variation, and among the tropical specimens there is considerable range in the hairs on the basal two-thirds of the first vein which are entirely absent in some of the specimens.

XANTHODEXIA Van der Wulp

Xanthodexia VAN DER WULP, *Biologia*, Dipt., vol. 2, 1891, p. 256.—BRAUER and BERGENSTAMM, *Zweifl. Kais. Mus.*, pt. 5, 1891, pp. 372, 377; pt. 6, 1893, p. 131.

Minthodexia BRAUER and BERGENSTAMM, *Zweifl. Kais. Mus.*, pt. 5, 1891, pp. 371, 376; pt. 6, 1893, p. 131.—TOWNSEND, *Ins. Ins. Menst.*, vol. 4, 1916, p. 7; *Rev. Mus. Paul.*, vol. 15, 1927, p. 218.

The type of *Xanthodexia* is *Tachina sericea* Wiedemann, the only species so far referred to the genus. *Minthodexia* originally contained two species, *gravipes* and *flavicornis*, both new, of which Townsend designated the former as type in 1916. I take the type to be the female of *sericea* Wiedemann. The characters are all discussed under the species. Brauer and Bergenstamm in 1893 erred in the statement that *gravipes* has a hairy first vein; it is *flavicornis* which has it.

122. XANTHODEXIA SERICEA Wiedemann

Tachina sericea WIEDEMANN, *Auss. Zweifl.*, vol. 2, 1830, p. 316.

Xanthodexia sericea VAN DER WULP, *Biologia*, Dipt., vol. 2, 1891, p. 256, pl. 6, Fig. 11.—BRAUER and BERGENSTAMM, *Zweifl. Kais. Mus.*, pt. 5, 1891, p. 377.

Minthodexia gravipes BRAUER and BERGENSTAMM, *Zweifl. Kais. Mus.*, pt. 5, 1891, p. 376.

The type of *Tachina sericea* Wiedemann is a male from Brazil, in poor condition, as Wiedemann said, on account of having been treated with a preserving fluid which has somewhat damaged the surface of the head and body as well as the wings. The type of *gravipes* is a female from Venezuela (Lindig, 1864). It is in excellent condition and the description will be drawn largely from this specimen. Besides the close correspondence between the two types there is a rather unique character in both, which has confirmed my belief that they belong to the same species. It is in the chaetotaxy of the abdomen. The second segment in *gravipes* has a large pair of

discal bristles located at the front edge and another pair equally large of marginals at the hind edge: the third segment has no discals, a peculiar fact when they are so well developed on the second. In the type of *sericea* there are evident scars of the large discals on the front edge of the second segment and also a pair of marginals at the hind edge, the third segment having no scars of discals.

Brauer and Bergenstamm as well as Van der Wulp were in error in overlooking the scars on the second segment. The principal difference between the two specimens is in the parafrontals, which in the male are so broad that they reduce the frontal stripe to a mere groove in its narrowest part before the ocelli. The female has broad and conspicuous parafrontals, but the frontal stripe still retains at the narrowest a width of nearly one-half of one parafrontal.

Female.—Front 0.31 of head width at the vertex, slightly wider at the antennae, the face becoming narrower again at the lower edge of the eyes. Frontal bristles about six, barely reaching the base of the antennae. Two proclinate orbitals, ocellars minute, diverging forward. Parafrontals silvery except on the upper part, the same smooth shining surface extending down the parafacial and across the face. The transverse impression is very narrow, extending from the vibrissa backward under the eye. In profile the head is hemispherical; the eye occupies all but a narrow rim of this figure. Back of the head flat and the cheek only about one-tenth of the eye height. The lateral edge of the mouth is black in ground color, in a narrow triangle extending hardly to the vibrissa and bearing three bristles behind it which are at the oral margin; face flat, with bare ridges. Antennae yellow as far as arista, the remainder infuscated; third joint more than twice the second, slender, but a little swollen at tip, the arista with delicate plumosity; palpi yellow, rather small; proboscis decidedly small but with large yellow labella. Lunule unusually prominent, yellow, contrasting with the dark brown frontal stripe. Thorax black in ground color except the humeri, postalar calli, and the margin of the scutellum. Mesonotum covered with golden pollen, which is quite thin in the middle region, more distinct on the sides, front, and hind edges and scutellum. Pleurae silvery-pollinose from the notopleural suture on all but the posterior part. Chaetotaxy: Acrostichal 3, 3(?); dorsocentral 3, 3; humeral 2; posthumeral 1; intraalar 2; supraalar 2 (posterior small); postalar 2; presutural 1; notopleural 2; scutellum with two lateral pairs and a good-sized decussate apical pair, no discals; sternopleural 1, 1; postscutellum well developed. Calypters pale yellow, the hind ones large, with rim and fringe of same color.

Abdomen shining yellow without pollen, the tip shining black including the last third of the third segment and all of the fourth

except a narrow front edge, the yellow color, however, continuing to the apex on the venter. Bristles of abdomen as described above, a single lateral on the first and second segments; one ventral pair on the first, second, and third segments arising from the margins of the tergite, which come entirely together; third segment with a marginal row of six or eight.

Legs yellow, tibiae somewhat infuscated, tarsi black; front tibia with one outer bristle, middle tibia with one on outer front, one on inner front, none on inner hind sides; hind tibia on the outer hind side with a row of small slanting bristles from base to middle, the last larger; also one small on outer front side and one very small on inner hind side before the middle.

Wing broad, somewhat infuscated throughout along the veins and the apical part before the third vein more uniformly so; fourth vein with rounded bend, thence with very slight concavity, ending considerably before the apex; the first posterior cell open, hind cross vein almost straight, joining fourth vein at two-thirds of the distance from the small cross vein to the bend. First vein bare, third with coarse hairs almost to the cross vein. No costal spine.

Length, 8 mm.

Male.—The third antennal joint is entirely yellow, the thoracic chaetotaxy is considerably damaged, but agrees in large part, otherwise as in female.

Not represented in the United States National Museum.

123. *XANTHODEXIA FLAVICORNIS* Brauer and Bergenstamm

Minthodexia flavicornis BRAUER and BERGENSTAMM, Zweifl. Kais. Mus., pt. 5, 1891, p. 376.

Since the genotype of *Minthodexia* is identical with that of *Xanthodexia* I place this species provisionally in the latter genus. The specimen is hardly in good enough condition to base a new genus upon and perhaps in spite of the hairy first vein it should be allowed to remain here. The type, which is a female from Venezuela (Lindig, 1864) has been quite badly broken and the third antennal joint is now gone. The head apparently has about the same shape as in the female of *sericea*, but the uppermost of the two orbitals is strongly reclinate (lower broken off); the ocellars are very minute and hair-like, proclinate. The scars show two verticals close together on each side, some distance in front of which there is one strong reclinate bristle, followed by one equally strong which is proclinate; somewhat farther forward are two orbitals, the upper large and reclinate, the lower represented only by a scar; below these and closer to the middle are two more frontals (scars) the lowest rather large and just on a level with the upper edge of the first antennal joint; the frontal stripe seems to blend with the parafrontals and is hairy to the center.

The front is yellow pollinose above, silvery below, which color extends down around the eye and across the face. The parafrontals are much narrower than in *sericea* except below. Palpi and proboscis small and yellow. Thorax with cinereous pollen above; humeri yellow in ground color; pleurae with silvery pollen extending down the middle part. Thoracic chaetotaxy as in *sericea*, but the acrostichals are very small and the scutellum has a small pair of discal bristles; the abdomen shining yellow to about the middle of the third segment, the remainder shining black except below; a very distinct silvery pollinose crossband on the base of the third and fourth segments; first segment without median marginals; second with one pair and one lateral; third and fourth each with marginal row of six; on the venter there is a marginal pair of bristles close together on the second and third segments, arising from the tergites, which in the specimen overlap considerably.

Wing almost as in *sericea*, the infuscation a little more diffused; third vein with distinct hairs extending far beyond the cross vein; first vein hairy from base to tip, no costal spine. Coxae and femora yellow (the front femora missing); middle tibia slightly infuscated, with two good-sized bristles on outer front side, two smaller on outer hind side, and one small on flexor surface; tarsi black; hind tibia more densely infuscated, with almost villous hairs on the flexor surface, four bristles of varying size on outer hind side; four on outer front side, only the last of which is of noticeable size.

Length, 5.5 mm.

Not represented in the United States National Museum.

124. CALLESTHES DILECTA Wiedemann

Musca dilecta WIEDEMANN, AUSS. Zweifl., vol. 2, 1830, p. 419.

? *Zosteromyia dilecta* BRAUER and BERGENSTAMM, Zweifl. Kais. Mus., pt. 5, 1891, p. 406.

One male indicated as type, "Brasilien, Coll. Winthem." Agrees with original description, but is in rather poor condition. All of the legs are gone but one (middle). The head is pressed in from below, which must have occurred when the specimen was fresh a century ago or more; this prevents a complete description of the head structures. The thorax has been damaged by the pin. Undoubtedly the type. I refer the species provisionally to my recently described genus *Callesthes*⁹ of which the type is *Callesthes histrio* Aldrich, from Ecuador, described in the same place. *Callesthes dilecta* differs in having much narrower parafrontals, the wing distinctly brown, bend of fourth vein much more abrupt. The two species agree in the striking transverse band just before the suture, extending down to the sternopleurae, and

⁹ Proc. U. S. Nat. Mus., vol. 74, art. 1, p. 11.

in having interrupted silvery basal crossbands on the abdominal segments. The head structure is very similar and both have the first posterior cell ending in the apex of the wing. The following description is as complete as can be made from the type; the species is certainly recognizable from this on account of the striking thoracic crossband.

Male.—Hypopleurals and postscutellum well developed. Front at narrowest 0.07 of head width, or just about the width of ocellar triangle; the parafrontals are very narrow, so that the frontal stripe at its narrowest is wider than one of them. Eyes bare, the facets rather large in the region above the middle and toward the median line of the head. The front was apparently a little prominent, and the cheek was certainly rather broad, about one-third the eye height as nearly as can be estimated. Vibrissae well developed, at or near epistoma. Palpi of normal size, rather brown, proboscis short, fleshy. The orbit is white or probably silvery all the way round the eye; parafacial at least as wide as third antennal joint, apparently with a few minute black hairs in a single row. Antennae black, third joint one and one-half times the second, red at base; arista plumose, its base thickened. Frontal bristles beginning far before the ocelli and ending barely below the attachment of the antennae, perhaps even before it. The thorax shows very little on account of its damaged conditions, except the silvery crossband, which lies against the suture, occupying over one-third of the space to the anterior edge of the mesonotum and at the sides expanding to hind edge of humeri; on the pleura it includes the posterior half of the mesopleura and a part of the sternopleura.

Abdomen black; second and third segments with wide basal interrupted crossbands of white or perhaps silvery pollen; the median interruption is narrow at extreme base, widening posteriorly. First segment with a row of about 10 rather widely spaced slender marginal bristles, second and third segments with scars of a similar row but perhaps stouter. No discals. Fourth segment in bad condition, but apparently has some pale pollen at base and a few apical bristles. Genitalia small, black, concealed between the large plates of the fifth sternite.

Wing hyaline, first vein bare, third with one or two hairs at base; hind cross vein very straight, halfway between small and bend of fourth vein, the latter very oblique, concave beyond, ending in the exact apex, the first posterior cell open. The second vein ends near tip of third so that the costal section before it is about three times as long as the one beyond. Wiedemann gives the length as 4 mm.

The species is not represented in the United States National Museum.

Genus *CALODEXIA* Van der Wulp

Calodexia VAN DER WULP, Biologia, Dipt., vol. 2, 1891, p. 257.—BRAUER and BERGENSTAMM, Zweif. Kais. Mus., pt., 6, 1893, p. 131.—TOWNSEND, Rev. Mus. Paul., vol. 15, 1926, p. 219.

Oestrogaster TOWNSEND, Proc. U. S. Nat. Mus., vol. 43, 1912, p. 309; Ent. News, vol. 26, 1915, p. 28; Rev. Mus. Paul., vol. 15, 1926, p. 223.

Oestrogastropsis TOWNSEND, Proc. U. S. Nat. Mus., vol. 49, 1915, p. 424; Rev. Mus. Paul., vol. 15, 1926, p. 223.

Oestrogastrodes TOWNSEND, Proc. U. S. Nat. Mus., vol. 49, 1915, p. 425; Rev. Mus. Paul., vol. 15, 1926, p. 225.

The genus *Calodexia* originally included three species, of which Coquillett (Proc. U. S. Nat. Mus., vol. 37, 1910, p. 517) designated *Calodexia majuscula* Van der Wulp as type. He identified a male specimen from Cuernavaca, Mexico, as belonging to this species. I recently sent this specimen to the British Museum, where Major Austen kindly compared it with Van der Wulp's type, and reports it to be correctly identified.

Townsend proposed all three of his genera on female specimens. The type and sole species of *Oestrogaster* is *Oestrogaster fumosus* Townsend; that of *Oestrogastropsis* is *Oestrogastropsis mexicana* Townsend; and that of *Oestrogastrodes* is *Oestrogastrodes similis* Townsend. A male undoubtedly belonging to *similis* has since been discovered in our material, and we have a female of *flavipes* Schiner; so there are two species in which both sexes are known.

In order to elucidate the following species of Schiner it is necessary to consider the characters of the genotype of *Calodexia*.

The type specimen of *Calodexia majuscula* is a male, and the female has not yet been associated with this species. It must be very much like *similis* Townsend. In the male the eye is very large, front in profile not prominent, antennal axis short, vibrissal about three-fourths as long; the front is 0.16 of the head width above, widening but little to the antennae and the face still quite narrow; ocellars merely hairs; outer vertical not developed; two large upper frontals reclinate, remainder smaller, decussate, lowest barely at insertion of antennae, which is at middle of eye, third antennal joint two and a half times the second, arista thickened at base, sub-plumose for a short distance beyond the thickening, the plumosity rapidly diminishing in length and the apical half practically bare. Parafacials very narrow; vibrissae at oral margin, ridges bare above them and rather flat. Check about one-fifteenth of eye height. Palpi and proboscis normal. Infrascapular hairs present but pale (in our other species usually only one or two hairs present, sometimes none). Abdomen slender and pointed; first and second segments with a pair of erect median marginals, third with a marginal row; second and third with a large erect, discal pair; fourth as long

as third, pointed, with a discal row and two irregular marginal rows. Male genitalia small and concealed, the tergite overhanging them somewhat as in the less developed species of *Uramyia*. Wing rather narrow, fourth vein with rounded oblique bend, not concave except near tip, ending but little before apex of wing, beyond the bend almost parallel with hind margin of wing. First posterior cell open, close to costa its sides are almost parallel. Third vein with several hairs at base; hind crossvein joining fourth vein at two-thirds the distance from small to bend.

Antennae, palpi, proboscis, coxae, femora, tibiae, and sides of first three abdominal segments yellow. Femora not thickened, under side of middle and hind ones with distinct whitish cilia on apical two-thirds, quite long and dense and apparently a good specific character for the male. Front tibia with one bristle on outer hind side, mid tibia with one on outer front, hind tibia with two smallish pairs behind, at, and before middle, and a pair subapical; on the inner flexor side at base some sloping villous hairs, which diminish and disappear near middle. Claws and pulvilli moderately elongated. Basal half of abdomen below with long delicate white hairs.

The female of *majuscula* is not known, but from what is known of the related species may be expected to have the abdomen short and deep, more or less keeled, the fourth segment narrow and elongated forward underneath, so that its discal row of bristles becomes two longitudinal and almost parallel rows, and the genital opening is pushed forward underneath almost or quite to the middle of the venter. This remarkable peculiarity makes the females look different from the males, but the other characters agree well in both sexes.

125. CALODEXIA FLAVIPES Schiner

Meigenia flavipes SCHINER, Novara Reise, 1868, p. 326.

Calodexia flavipes BRAUER and BERGENSTAMM, Zweifl. Kais. Mus., pt. 5, 1891, p. 376.

Myobia (?) *flavipes* BRAUER and BERGENSTAMM, Zweifl. Kais. Mus., pt. 6, 1893, p. 131.

One male, the undoubted type, "Novara R. Brasilia."

Male.—Closely related to *Calodexia majuscula*. The head is of the same shape, much higher than long in profile, almost circular from in front. The height, length, and width are 53, 32, and 56 in micrometer units. The eyes are very large, both front and face narrower than in most tachinids, and the cheek only one-twentieth of the eye height. The front is very little projecting in profile, even less than in *majuscula*. It measures the same from the middle to the vertex, 0.17 of the head width, the eyes gradually diverging farther downward. Ocellars hairlike, proclinate; outer vertical not developed; frontals forming a denser and more homogeneous series than in

majuscula, the upper two or three pairs reclinate, the following gradually becoming decussate, but there is no break in the series, which extends just to the base of the second antennal joint. Antennae brown, third joint slender, red at base, almost three times the second, arista slender, a little enlarged at base, distinctly pubescent on about the basal third. This pubescence is shorter than what I have called short plumosity in *majuscula*. The narrow parafrontals and still narrower parafacials are bare, with dull yellowish pollen in the ancient type; palpi and labella yellow.

Thorax black in ground color with dense yellow pollen, on which two pairs of black stripes are distinct, the inner blending just at the suture into a large heart-shaped spot not quite reaching the scutellum, and showing a reddish brown color in an oblique view; the outer tapering abruptly to a point before the scutellum. Scutellum opaque black, with yellow-pollinose border. Chaetotaxy: Acrostichal 1, 1; dorsocentral 2, 3; humeral 2; post-humeral 1; presutural 1; notopleural 2; supraalar 2; intraalar 3; postalar 2; sternopleural 1, 1; scutellum with 3 lateral pairs, a minute divergent apical pair hardly distinguishable from hairs, and a small subapical pair on disk. Several distinct dark infrascapular setules.

Abdomen rather slender, dark yellow with a broad ill-defined black median stripe; the second tergite is deformed in the specimen. First segment with median marginal pair of bristles; second with discal and marginal pairs; third with discal pair and marginal row; fourth with discal row and irregular marginal row partly double.

Front legs rather dark yellow, including coxae, tarsi black; middle femora yellow on basal half, the rest blackish, their tibiae brown; hind femora yellow on more than basal half, their tibiae brown, but in the middle yellowish. The middle femora are densely ciliated with dark yellowish pile on the anterior flexor side from about the middle; the hind femora have similar cilia on both the anterior and posterior flexor sides. The hind tibiae have rather dense and long appressed hair on the flexor side at base. Claws and pulvilli moderately elongated.

Wings rather uniformly brown, deeper along the veins. Venation as in *majuscula*.

Female.—A female in the United States National Museum (Higuito, Costa Rica, collected by Pablo Schild) shows the following additional characters: Front 0.26 of head width at vertex and antennae, but widening to 0.28 in the middle; pollen of head cinereous, not yellow; arista with a little longer pubescence on basal third; intermediate thoracic stripes hardly confluent behind suture; pollen of thorax cinereous; posterior acrostichals 3, all but the hindmost small; abdomen short and thick, keeled below; the female genitalia ending in

a blunt tube projecting straight down from the abdomen at about its middle; pollen of abdomen gray, with large dots at bases of the hairs and bristles, apices of second and third segments subshining black; fourth segment wholly pollinose, the discal row of bristles distorted into the shape of a narrow ellipse or almost into two parallel longitudinal rows. The abdomen is not yellow at the sides as in the male. Legs brownish black, the front femora yellowish underneath on apical half, middle and hind femora without distinct ciliation underneath.

Wings of a lighter and more uniform brown.

Length of male, 9.6 mm.; of female, 7 mm.

126. *CUPHOCERA MACROCERA* Wiedemann

Tachina macrocera WIEDEMANN, AUSS. Zweifl., vol. 2, 1830, p. 290.

Cuphocera macrocera SCHINER, Novara Reise, 1868, p. 330.

Elachipalpus macrocera BRAUER and BERGENSTAMM, Zweifl. Kais. Mus., pt. 5, 1891, p. 406.

Schiner gives only a brief note on a pair from Brazil. Brauer and Bergenstamm give only the generic reference.

The material received from Vienna under this name is as follows:

1. A male labeled *Tachina macrocera* Wiedemann and also "Brasilia, Coll. Winthem," it also bears a recently added red "Type" label. This, however, can not be Wiedemann's type, as it has antennae of ordinary size, while Wiedemann says "Antennis maximis," and "Mit sehr grossen Fühlern." We have additional specimens of this species, and I am describing it below as *Copecrypta orbitalis* new species.

2. A male and female each labeled "macrocera det. B. B.," and "Novara R. Brasilia." These are apparently the pair mentioned by Schiner as *macrocera*, since they differ in the antennae as he says. The female belongs to *Copecrypta nitens* Wiedemann, mentioned below, and the male I identify with *Copecrypta nitidifrons* Van der Wulp, on comparison with two female paratypes of that species from Mexico donated to the United States National Museum by the authorities of the British Museum. It has antennae of ordinary size and differs from *orbitalis* most obviously in not having orbital bristles.

None of the three specimens belongs to *macrocera* Wiedemann, but a male sent along for identification and belonging to a related species is, I am confident, the true *macrocera*, and very likely the type specimen, as it dates from the same period.

The species is here referred to the genus *Cuphocera*, the genotype of which (*ruficornis* Macquart of Europe) has rudimentary, minute palpi and no ocellar bristles, while *macrocera* has no palpi and a distinct pair of ocellars. Townsend has proposed the genus *Deo-*

palpus for an American species (*hirsuta* Townsend) with neither palpi nor ocellars, and *Spanipalpus* for one (*miscelli* Coquillett) which like *macrocera* has ocellars but no palpi. These distinctions are, I think, too slight to base genera upon.

Male (fig. 1).—Front wide, at vertex 0.41 of head width; two pairs of large verticals; one pair of ocellars as large as the average of the frontals, the latter extending somewhat below the base of the antennae with a supplementary outer row of four along the broadest part of the parafrontal, all of these directed toward the middle except the upper two or three which are reclinate. Parafrontals broad, subshining except next to the eye, considerably wider than the middle stripe. Entire face, including cheeks, pale in ground color with silvery pollen, which is distinctly tinged with yellow on the cheeks and very faintly so on the parafacials; the middle of the face somewhat bulging, the ridges very flat, bare; edge of mouth moderately protuberant. Parafacial with one stout black bristle on lower part and a few pale hairs above and below it. Antennae red, third joint dark on apical half, very large and triangular as shown in figure; the arista has a long penultimate joint, the apical one pubescent, flattened on the basal third or more. Palpi absent. Proboscis beyond elbow about equal to height of head. Beard white, rather bushy. Thorax gray, with four distinct blackish stripes. Pre-sutural acrostichals, three pairs. Scutellum with two lateral pairs and a small decussate apical. Some pale hairs on pleurae not very striking; one large pteropleural bristle nearly equal to the largest scutellars.

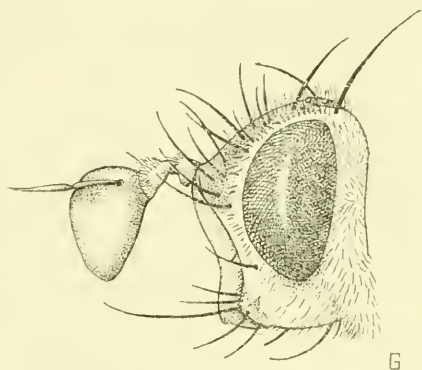


FIG. 1.—HEAD OF CEPHOCERA MACROCERA WIEDEMANN, MALE (SUPPOSED TYPE). DRAWN BY C. T. GREENE

Abdomen black, subshining, with thin gray pollen which is quite changeable in different angles of view. The fourth segment yellow on apical two-fifths, this color extending forward on the median line to three-fifths. First segment without median marginals; second with one pair rather close together; third with one pair and three at the side; fourth with several bristles on apical half.

Legs black, under side of femora reddish on apical half; middle and hind tibia with reddish tinge except at base; front pulvilli not much enlarged; middle tibia with several stout bristles on outer front side. Hind tibia with a few not so large on outer hind side and others on inner hind side.

Wing slightly brownish, bend of fourth vein rectangular with a slight appendage; beyond the right angle the vein is concave, thence straight in a diagonal direction toward the costa. Third vein bristly almost to cross vein. Calypters white.

Length, 11 mm.

Described from one male, "Brasilia, Alte Sammlung," another label reads "ad. Elachipalpus det. B. B."

Not represented in the United States National Museum.

COPECRYPTA ORBITALIS, new species

Male.—Front at vertex 0.35 of head width; two pairs of verticals, no ocellars, upper two frontals reclinate, only five anterior to them in a single row, two large proclinate orbitals. Ground color of parafrontals black, of parafacials, face and cheeks pale, all overlaid with golden pollen; upper half of the parafrontals with thinner pollen and rather dense erect black hair; parafacial with two stout macrochaetae and some pale pile, the latter continuing on the cheek; beard yellow. Antennae red except apical part of third joint; second joint fully equal to third, the latter convex in front, more straight behind, rather pointed, not very broad. No palpi; proboscis beyond joint barely equal to height of head. Thorax black with thin plumbeous pollen on dorsum in best specimens, nearly shining in others; the pollen shows two narrow submedian black stripes in front, between two wider ones. Acrostichal 3, 4; dorsocentral 3, 4; setellum with two large lateral with a small between them, and a small decussate apical pair. Sternopleural 4, with a stout pteropleural about equal to the largest scutellar. Calypters yellow. Abdomen sub-shining black with fourth segment deep red on apical half dorsally, less below, and a trace of red on the sides of the second segment. The pollen and bristles are as in *macrocera*. Legs black; front pulvilli distinctly elongated; several bristles on outer front side of middle tibia, hind tibia with a few on outer and inner hind sides. Wings distinctly brownish, fourth vein bent at right angle; concave immediately beyond the angle, thence straight in a rather upright course to the margin; third vein bristly less than halfway to cross vein.

Female.—Front of exactly the same width as in the male, but the third antennal joint smaller and less convex, about three-fourths as long as second. The abdomen is broader and has no trace of red at the sides. The three intermediate joints of the front tarsi are distinctly flattened.

Length, 7–8 mm.

Described from two males and three females (including the type) Posorja, Ecuador (Prof. F. Campos R.); one female from Peru (Townsend); and one male from Brazil (Coll. Winthem.) which

will be returned to the Vienna Natural History Museum. The latter specimen has faded so the pollen of the head is almost silvery and the calypters are whitish yellow, but in other details agrees perfectly.

Type.—Male, Cat. No. 41.082. U.S.N.M.

127. COPECRYPTA NITENS Wiedemann

Tachina nitens WIEDEMANN, AUSS. Zweifl., vol. 2, 1830, p. 294.

Cuphocera nitens SCHINER, Novara Reise, 1868, p. 330.

One female specimen, "Brasilia, Coll. Winthem," which has lost one wing. It is labeled as type and agrees with Wiedemann's description and Schiner's comments.

It is clear that the common form in the United States, *ruficauda* Van der Wulp, type of the genus, can not be more than a variety of this, and I consider it a synonym. Wiedemann's specimen has darker antennae than usual, all the joints being decidedly brown except the tip of second and broad base of third. The abdomen is only very slightly red at tip and vaguely in certain lights on second and third segments, not so definitely as indicated by Schiner. These differences can be almost or quite matched in northern specimens of *ruficauda*. The antennae in *nitens* type are of the usual form in females of *ruficauda*, the third joint only a little longer than the second, widening gradually and subtruncate at tip. There are two parafacial bristles on one side, one on the other. I see no structural differences between the two forms except as noted.

128. ARCHYTAS PILIFRONS Schiner

Echinomyia pilifrons SCHINER, Novara Reise, 1868, p. 331.

One male marked as type and agreeing with the description. The locality label is "Novara R. S. America," but Schiner says it is from Chile. The species is represented in the United States National Museum by five specimens, as follows: One male, Southern Chile (M. J. Rivers); one male, Angol, Chile (D. S. Bullock); two males and one female, Chile (E. C. Reed).

In brief, the species is close to *Archytas piliventris* Van der Wulp, a common species in the Tropics, but differs in having the hairs of the parafacials black and the posterior half or more of abdominal segments two to four shining. It has the same median erect transparent membrane on the back of the penis as in *piliventris*, which hitherto has been the only *Archytas* in the National Museum having this peculiarity. With Schiner's description and these items the species should be recognizable.

129. PELETERIA ROBUSTA Wiedemann

Tachina robusta WIEDEMANN, AUSS. Zweifl., vol. 2, 1830, p. 290.

Echinomyia robusta VAN DER WULP, Tijdsch. v. Ent., vol. 26, 1883, p. 19.

Peleteria robusta BRAUER and BERGENSTAMM, Zweifl. Kais. Mus., pt. 5, 1891, p. 408 (gen. ref.)—GIGLIO-TOS, Mem. R. Acad. Sci. Torino, ser. 2, vol. 44, 1894, p. 9.—COQUILLETT, Revis. Tachin., 1897, p. 140.—CURRAN, Trans. Roy. Soc. Canada, ser. 3, vol. 19, 1925, pp. 225, 245, fig.

Peleteria robusta marmorata TOWNSEND, Ins. Ins. Menst., vol. 2, 1914, p. 185.

Peleteria texensis CURRAN, Trans. Roy. Soc. Canada, ser. 3, vol. 19, 1925, p. 246, Fig. 27.

Peleteria inca CURRAN, Trans. Roy. Soc. Canada, ser. 3, vol. 19, 1925, p. 247.

There are many other references in the literature, but the group is so difficult that it is almost impossible to determine the species without examining male genitalia, and this was never done until Curran's paper; even he, not having seen the material in the Vienna Museum, had the wrong species as *robusta*. There is no great probability that any of the writers after Wiedemann identified the species correctly; it is certain that Coquillett confused several species under this name; his synonymy and that of Van der Wulp and Giglio-Tos is no doubt largely erroneous. The type being a female, it might seem that a positive identification of the species would be impossible. The material received from Vienna under this name includes the undoubted female type from Montevideo; one male and one female, "Brasilien, Alte Sammlung"; and one female, "Beske, Brasilien." The last is *robusta* of Curran, according to a female specimen from Paraguay which he identified in the National Museum. It has much wider parafacials and red epaulets, but the other Brazilian female agrees with the type of *robusta* and is accompanied by a male with the same label and agreeing well. I therefore decide that this male is undoubtedly *robusta* and have spread its genitalia for study. I find it agrees with Townsend's and Curran's species as indicated. The epaulet is black in all three specimens, hence the species does not run to *robusta* in Curran's key.

The parafrontals are pollinose, abdominal segments mostly so; second antennal joint red, rather long and slender, third black, convex on dorsal side, not very large (a little larger in male); palpi long and slender as in nearly all the species; fourth abdominal segment mostly black in male, entirely reddish in female. The front at vertex in the type female is 0.43, in male 0.35 of head width. The second antennal joint in male is one and a fourth times, in female one and a half times, the third; the parafacial at narrowest is 0.27 in male, 0.29 in the female, of the greatest clypeal width (between the arms of the ptilinal suture).

The male genitalia are very difficult to draw in this genus. The specific differences are mostly in the united inner forceps. In

robusta (the Brazilian specimen from Vienna) these are very deeply grooved, the ridges widening a little toward the tip, which is concave at apex with a slight projection in the center. I am unable to make out, in the paratypes returned by Curran, the differences he mentions in the width of the male abdomen and the tip of the inner forceps, on which he separated *inca* and *texensis*.

Represented in the United States National Museum by 14 paratypes of *texensis*, from Oklahoma, Texas, Arizona, Mexico, and Costa Rica; 3 paratypes of *inca* from Peru; type, allotype, and 12 paratypes of *marmorata* from Peru; and 9 other Peruvian specimens. Several specimens from Dallas, Tex., were reared from *Cirphis unipuncta* Haworth, the army worm.

The type of *robusta* has on the second abdominal segment only a small depressed median marginal on one side, none on the other, while both of the Brazilian specimens which I have considered the same have a normal large pair. On examining the paratypes of *texensis*, I find one female which has this pair small and depressed, while another has one bristle small and depressed, the other represented by a scar. This character is evidently subject to a slight degree of variation and I do not think raises a serious question. Mr. Curran, who revised the genus *Peleteria* a few years ago, has seen this Brazilian material and the type, and agrees with me that *texensis* is the same.

130. DIAPHANOMYIA DIAPHANA Brauer and Bergenstamm

Paragynnomma diaphana BRAUER and BERGENSTAMM, Zweifl. Kais. Mus., pt. 5, 1891, p. 384.

Three males and one female, labeled as types; one of the males is from Venezuela (Lindig. 1864), the rest of the series are from Ypanema, Brazil (Natterer). The only locality mentioned by Brauer and Bergenstamm is Brazil, hence the Venezuelan specimen can not be considered a type, although it is the same species.

The genotype of *Paragynnomma* is *hystriæ* Brauer and Bergenstamm (syn. *Gabanimyia hystricosa* Townsend), which belongs to the genus *Trichophora* Macquart. It differs considerably from *diaphana* in having the abdomen densely bristly. Townsend has proposed *Diaphanomyia aurea* new genus and species¹⁰ for a species almost exactly like *diaphana*, yet differing in several slight characters. His tabulation of the differences between his *aurea* and *diaphana* Brauer and Bergenstamm is mostly illusory, as shown by the types, which are nearer to *aurea* than he supposed. He was endeavoring to interpret the description of *diaphana* without specimens. All the differences I can make out are the following: The front in *aurea* is

¹⁰ Bull. Amer. Mus. Nat. Hist., vol. 37, 1917, p. 229.

less pollinose, translucent when viewed from above; the third antennal joint is a little narrower; the parafacial hairs are all light yellow, while in *diaphana* there are one or two darker in male (more in female); the male paratype of *aurea* in the United States National Museum has only one marginal macrochaeta on the second abdominal segment, the right, and one discal, the left, on the third segment, indicating an unusual instability in this character; all the specimens of *diaphana* have one regular discal pair on second and third and a marginal pair on second; the abdomen is more shining in *aurea*, a little dull in *diaphana*, but possibly such old specimens have become dulled by age. The genus *Diaphanomyia* is barely distinct from *Trichophora* in having fewer abdominal bristles, but *diaphana* may be left here with *aurea* until longer series are examined.

The species *diaphana* is rather striking in appearance, with the abdomen yellow except the fourth segment, which is sharply set off by opaque black color; the legs, pleurae, humeri, and scutellum are yellow. The genus resembles *Copecrypta* in having no palpi, rather elongate proboscis; parafacial with one bristle and some hairs; second antennal joint about equal to third, penultimate joint of arista elongate; no ocellars, etc. It differs in the less erect apical crossvein and in having discal bristles on the abdomen.

One of the males from Brazil is retained, by courtesy of the Vienna Museum, as the species was not represented in our collection.

131. CYLINDROMYIA DORSALIS Wiedemann

Ocyptera dorsalis WIEDEMANN, AUSS. Zweifl., vol. 2, 1830, p. 264.

One male, "Brasilia Coll. Winthem," marked type and agreeing with description except in the legs. It is a typical *Cylindromyia*, like the European and North American. The scutellum has two pairs of strong lateral bristles, no apicals; the antennae are red except the apical and upper part of the third joint; the legs are red except the tarsi now (Wiedemann says "femora reddish, on the hindmost also the tibiae, elsewhere black," but perhaps they have faded in a century). The hind femur has three bristles in a close-set row on the outer side below at tip, other leg bristles about as in *brassicaria*. Wing yellow at base, extending along costa past the tip of first vein; from about the small crossvein the veins toward apex and costa are heavily bordered with brownish black, which fills the whole submarginal cell except its base; the petiole of the third vein turns more strongly forward than in *brassicaria*, joining the costa at a right angle. The male genital segments and organs are wholly red, probably somewhat faded; the genitalia are strongly like those of *brassicaria*, but the fifth sternite of the latter has two projections in the middle bearing tufts of setules and separated by

deep notch; while in *dorsalis* there is a single median process bearing two tufts of setules close together. The North American species studied by me in my paper on *Cylindromyia*¹¹ included none with two lateral pairs of scutellar bristles and no apicals, and *dorsalis* is not now represented in the United States National Museum.

Genus LEPIDODEXIA Brauer and Bergenstamm

Lepidodexia BRAUER and BERGENSTAMM, Zweifl. Kais. Mus., pt. 5, 1891, pp. 373, 379; pt. 6, 1893, p. 133.

Raimondia TOWNSEND, Proc. Biol. Soc. Wash., vol. 30, 1917, p. 47.

The type species of *Lepidodexia* is *tetraptera* Brauer and Bergenstamm; that of *Raimondia* is *urukuasi* Townsend, a closely related species. Both were described in the above references.

132. LEPIDODEXIA TETRAPTERA Brauer and Bergenstamm

Lepidodexia tetraptera BRAUER and BERGENSTAMM, Zweifl. Kais. Mus., pt. 5, 1891, p. 379; pt. 6, 1893, p. 133.

One male, the type and so marked, from "Lindig, 1864, Venezuela."

Male (fig. 2).—Head somewhat globose with the front prominent, antennal axis scarcely longer than vibrissal; cheek about two-thirds the eye height in side view, its posterior part rather bulging so that the eye has an oblique position. Front 0.15 of head width by micrometer at the narrowest place just before the ocelli; frontal bristles about 15 of uniform size, the upper scarcely reclinate, the lower hardly reaching the middle of the second antennal joint. Frontal stripe velvety brown, before the ocelli more than twice as wide as either parafrontal, the latter with the parafacials have a satiny brownish-yellow color. Where the parafrontals widen anteriorly they bear numerous small hairs which extend down on the parafacial to the transverse impression, which is large and dark red. Antennae black, third joint missing on both sides, said by Brauer and Bergenstamm to be three times as long as the second with the arista long-plumose on the basal half. Facial carina very distinct, but hardly more prominent than the ridges, which bear good-sized hairs up to the middle. Epistoma much above the lower edge of head, the profile sloping upward very decidedly. Below the vibrissae are about six bristles in a single row and a few more on the cheek, bordering the lower part of the transverse impression. All the hairs of the head are black, palpi black, hairy, of ordinary size; proboscis rather small with good-sized labella. Thorax brownish pollinose with darker longitudinal stripes, the humeri and lower part of pleurae more cinereous. Chaetotaxy: Acrostical 0, 1; dorsocentral 2, 3; humeral 3; post-humeral 1; presutural 1; supraalar 2; intraalar 2; postalar 2;

¹¹ Proc. U. S. Nat. Mus., vol. 68, art. 23, 1920, pp. 1-27.

scutellum with only two pairs of laterals, no apical, one pair of discals, besides which there are only ordinary hairs; sternopleural 1, 1; pteropleural 0; infrascumal setules a very distinct group of about a dozen, which should be a good character; propleura densely hairy. Postscutellum absent, the metanotum moderately convex in the middle as in *Sarcophaga*. Hind calypters remarkably large, yellowish brown in color, the middle lighter. In the specimen the wings are divergent and the calypters are flattened so as to be very conspicuous from above, which evidently suggested the name *tetraptera*.

Abdomen black, the hind margins of the first three segments with dark brown pollen which extends forward in the middle to form a rather distinct median stripe, but toward the sides changes anteriorly to a lighter color so as to leave a pair of pale yellowish pollinose triangles on the anterior part of the second and third seg-

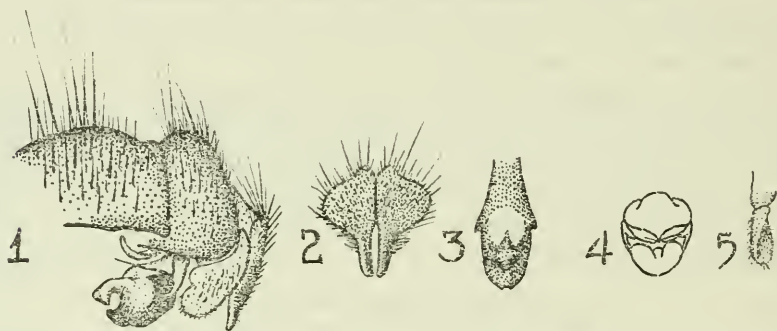


FIG. 2.—*LEPIDODEXIA TETRAPTERA* BRAUER AND BERGENSTAMM. 1. LEFT LATERAL VIEW OF GENITAL SEGMENTS OF MALE. 2. REAR VIEW OF FORCEPS. 3. REAR VIEW OF PENIS. 4. TIP OF PENIS. 5. REAR VIEW OF ACCESSORY PLATE. DRAWN BY DAVID G. HALL

ments; fourth segment with pale yellow pollen except in the middle on the front part; first and second segments with only lateral macrochaetae, no marginals; third segment with a marginal pair and a rather dense group of about eight on each side. Fourth segment with a double interrupted marginal row running into a group at each side. These lateral groups are what Brauer and Bergenstamm called fasciculi. Genitalia as figured.

Legs black, front tibia with a long outer bristle, middle tibia with one on outer front and two on outer hind sides, no flexor; hind tibia with two on outer hind side, two on inner hind and one on outer front sides, the latter at two-thirds the length. None of the tibiae bear villosity. Pulvilli dark brown, moderately elongate and considerably widened; the front tarsus exceeds the tibia by about the last joint.

Wing subhyaline, the small crossvein infuscated, the fourth vein bent at a slightly acute angle and ending not very far before the

apex, about as far from it as twice the distance between the tips of the third and fourth veins. First vein bare, third bristly almost to the cross vein.

Length, 11 mm.

Not represented in the United States National Museum.

Townsend's *Raimondia uruhuasi* was described from a single female, but the Museum possesses three males and an additional female from Huascaray Ridge, Jaen Province, Peru, September 21 and 22 (Townsend). The species is very close to *tetraptera*, showing only three differences that I can see. The wings are considerably infuscated, especially the crossveins; the male has a pair of long parallel upright apical scutellars, the tips of which curve forward; the abdomen of the male has a somewhat more contrasting pattern, with better defined subsilvery triangles on anterior lateral part of the second, third, and fourth segments. The female of *tetraptera* is unknown, but that of *uruhuasi* has no apical scutellars and the abdominal pattern while similar to that of the male, is more tessellated. The male genitalia have been carefully compared and seem identical. It may yet prove that *uruhuasi* is merely a subspecies of *tetraptera*.

The genus *Lepidodexia* belongs to the family Sarcophagidae, as indicated by Brauer and Bergenstamm.

SUMMARY OF CHANGES OF NOMENCLATURE PROPOSED

NEW SPECIES

Oopecrypta orbitalis Aldrich, from Ecuador and Brazil.

NEW SYNONYMY

Euzelia Townsend equals *Zelia* Robineau-Desvoidy.

Therevops Brauer and Bergenstamm equals *Telothyria* Van der Wulp.

Minthodexia Brauer and Bergenstamm equals *Xanthodexia* Van der Wulp.

Minthodexia gravipes Brauer and Bergenstamm equals *Xanthodexia sericea* Van der Wulp.

Oestrogaster Townsend, *Oestrogastropsis* Townsend, and *Oestrogastrodes* Townsend are synonyms of *Calodexia* Van der Wulp.

Peleteria robusta marmorata Townsend, *Peleteria texensis* Curran, and *Peleteria inca* Curran are synonyms of *Peleteria robusta* Wiedemann.

Raimondia Townsend equals *Lepidodexia* Brauer and Bergenstamm.

NEW COMBINATIONS

Zelia potens Wiedemann for *Dexia potens* Wiedemann.

Zelia phaeoptera Wiedemann for *Dexia phaeoptera* Wiedemann.

Zelia atrifrons Wiedemann for *Musca atrifrons* Wiedemann.

Zelia limbata Wiedemann for *Dexia limbata* Wiedemann.

Zelia plumosa Wiedemann for *Dexia plumosa* Wiedemann.

Telothyria brevipennis Schiner for *Miltogramma brevipennis* Schiner.

Leskiopalpus famelicus Wiedemann for *Stomoxyys famelica* Wiedemann.

Xanthodexia flavicornis Brauer and Bergenstamm for *Minthodexia flavicornis* Brauer and Bergenstamm.

Callesthes dilecta Wiedemann for *Musca dilecta* Wiedemann.

Copecrypta nitens Schiner for *Cuphocera nitens* Schiner.

Archytas pilifrons Schiner for *Echinomyia pilifrons* Schiner.

Diaphanomyia diaphana Brauer and Bergenstamm for *Paragymnomma diaphana* Brauer and Bergenstamm.



A NEW SPECIES OF TRICHOSTRONGYLID WORM OF THE GENUS COOPERIA FROM THE CARABAO IN THE PHILIPPINE ISLANDS, WITH A REVIEW OF THE GENUS

By BENJAMIN SCHWARTZ

Senior Zoologist of the Bureau of Animal Industry, United States Department of Agriculture

Under date of September 9, 1927, Dr. Angel K. Gomez, of the College of Veterinary Science of the University of the Philippines, forwarded to the writer a portion of the small intestine of a carabao calf (*Bubalus bubalus*) from Los Baños, Laguna, with the information that the animal had died from inanition and was extremely emaciated before it died. Doctor Gomez said that on post-mortem examination the small intestine was found to contain nodules throughout its length and that teased preparations of the nodules revealed the presence of small roundworms.

Examination of the material by the writer showed the mucosa to be riddled with small, conspicuously raised nodules, varying from about 3 to 5 mm. in diameter, the summit of each nodule being more or less depressed and containing a small opening into a channel of communication between the parasite and the lumen of the intestine. Each nodule contains a single worm which is rather deeply imbedded in the mucosa and is very much twisted, the twists being due, apparently, to the technic of fixation. The worms belong to the genus *Cooperia* and represent a heretofore undescribed species for which the name *Cooperia nodulosa* is proposed. On the evidence this worm must be regarded as pathogenic and probably of economic importance.

COOPERIA NODULOSA, new species

Specific diagnosis—*Cooperia*: The head (fig. 1) varies in diameter with the degree of cuticular expansion and ranges from about 47μ to slightly over 50μ and bears 4 submedian papillae and 2 amphids or so-called lateral papillae. The esophagus (pl. 1, fig. 1) is slightly less than 0.5 mm. long in the male and from 0.5 mm. to slightly longer in the female, with a maximum diameter of 46μ . The nerve ring is located slightly posterior to the middle of the esophagus.

Male.—The male is about 7.2 mm. long by about 218μ in maximum width in the region of the spicules where the body is decidedly swollen. The externo-lateral ray (pl. 1, fig. 2) is more slender than the latero-ventral ray which is the thickest of all rays; the externo-lateral ray comes next in thickness; the medio-lateral and postero-lateral rays have about the same thickness; the externo-dorsal is next in thickness, and the ventro-ventral is the most slender of the paired rays; the tips of the paired rays, that is, all rays other than the dorsal ray, come close to the edge of the bursa, those of the medio-lateral and postero-lateral rays being most closely approximated to each other; the dorsal rays (pl. 1, fig. 3) bifurcates, each

terminal branch ending in two blunt digitate processes; each terminal stem of the dorsal ray gives off a branch in its posterior portion having a more or less horizontal direction along the transverse axis of the worm. The spicules (pl. 1, fig. 4) are from 304 to 320μ long and are provided with seven tooth-like processes directed toward the median line in its posterior portion.

Female.—The female is slightly over 11 mm. long by about 200μ in maximum width. The vulva (pl. 1, fig. 5), located at a distance

of 2 mm. from the tip of the tail, is transversely elongated and is covered by a prominent cuticular linguiform flap. The combined lengths of the ovejectors, including the sphincters, is about 440μ . The tail (pl. 1, fig. 6) is about 210μ long and tapers to a point. The eggs are from 40 to 51μ long by 31μ wide.

Host.—*Bubalus bubalus*.

Location.—In nodules in mucosa of small intestine.

Locality.—Los Baños, Laguna, P. I.

Type specimens.—U. S. National Museum No. 24863.

Paratypes.—U. S. National Museum Nos. 24864 and 24865.

Genus COOPERIA

The genus *Cooperia* was proposed by Ransom (1907) who assigned to it four species as follows: *Cooperia curticei* (Railliet, 1893) (= *Cooperia curticii* Giles, 1892); *Cooperia punctata* (Schnyder, 1907); *Cooperia oncophora* (Railliet, 1898); and *Cooperia pectinata* Ransom, 1907. Since 1907 the following species have been added to

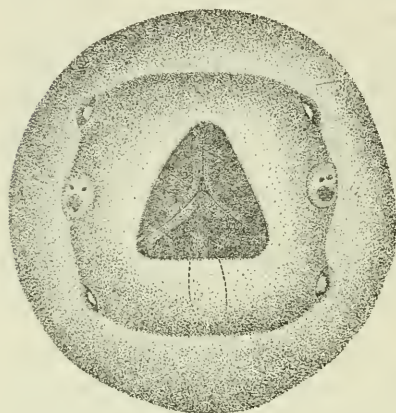


FIG. 1.—COOPERIA NODULOSA. TOP VIEW OF HEAD

the genus: *Cooperia alata* Railliet and Henry, 1909; *Cooperia macieli* (Travassos, 1915); *Cooperia elegans* Travassos, 1921; *Cooperia falsa* Travassos, 1921; *Cooperia harkeri* (Stödter, 1901); *Cooperia bisonis* Cram, 1925; and *Cooperia fuelleborni* Hung, 1926.

So far as concerns *Cooperia alata* Railliet and Henry, 1909, from the intestine of a macacus monkey, the specific description, which is based on a male, is very brief and is unaccompanied by illustrations. Railliet and Henry say that the cuticle of the body has about 16 longitudinal lines, and this morphological feature is characteristic of the genus *Cooperia*. However, they also say that *C. alata* possesses a gubernaculum, and this structure is not known to be present in the four species referred to this genus by Ransom in 1907 nor in any other species that definitely belongs to it.

Cooperia macieli (Travassos, 1915) is described from the stomach of *Dasyurus novemcinctus* (= *Tatus novemcinctus*) and is well illustrated in Travassos's paper on the family Trichostrongylidae published in 1921. Although the latero-ventral ray is larger than the ventro-ventral ray as shown in his illustrations and described in his text, whereas in other species of the genus the ventro-ventral ray is much more slender than the latero-ventral ray, the species in question has the primary characters of the genus *Cooperia*.

Cooperia elegans Travassos, 1921, from the small intestine of *Saimiris sciurea*, and *Cooperia falsa* Travassos, 1921, from the stomach of *Cabassus unicinctus* are described briefly without illustrations, and the descriptions contain no characters on the basis of which the worms can be assigned with certainty to the genus *Cooperia*. For the present, at least, these two species must be regarded as having doubtful generic affinities, and until more detailed descriptions with figures are published the writer considers that there is a lack of evidence on which to definitely assign these species to the genus *Cooperia*.

Cooperia harkeri Stödter, 1901, from cattle, is placed in this genus by Fiebiger (1923). Harker's (1893) figure shows that the species in question does not belong to the genus *Cooperia*. In the opinion of Ransom (1911), this species is identical with *Ostertagia ostertagi*.

Cooperia fuelleborni Hung, 1926, from *Kobus ellipsiprymnus* is very closely related to *Cooperia curticei*, as noted by Hung, his differentiating characters not being sufficient, in the opinion of the writer, to warrant the erection of new species, and in this paper *C. fuelleborni* is regarded as a synonym of *C. curticei*.

The following key will serve to differentiate the known species of the genus *Cooperia* and to indicate the position of *Cooperia nodulosa* in the genus:

KEY TO DESCRIBED SPECIES OF COOPERIA

1. Species placed in, but not definitely recognizable as belonging to, the genus *Cooperia*----- 2.
Species definitely recognizable as belonging to the genus *Cooperia*----- 3.
2. Gubernaculum present; spicules 120μ to 130μ long, terminating in two processes of different shape and size; male 2.9 to 3.5 mm. long; female 4.3 to 4.9 mm. long----- *Cooperia elegans*.
Gubernaculum absent; spicules 134μ to 156μ long, terminating in three processes of different shape and size; male 4.5 to 6 mm. long; female 4.3 to 4.9 mm. long----- *Cooperia falsa*.
3. Gubernaculum present; spicules 115μ long, with a recurved hook located at a distance of 45μ from tip; male 2.8 mm. long; female unknown. *Cooperia alata*.
Gubernaculum absent; spicules more than 115μ long and without a recurved hook in posterior third----- 4.
4. Ventro-ventral ray thicker than latero-ventral ray; spicules 170 to 180μ long, each with median process 120μ long, and each spicule terminating in two slender processes; male 7 to 9 mm. long; female 7 to 11 mm. long. *Cooperia macieli*.
Ventro-ventral ray more slender than latero-ventral ray; spicules not ending in two processes----- 5.
5. Spicules over 300μ long, with 7 toothlike structures in the posterior portion; female vulva covered by a linguiform flap; male 7.2 mm. long; female 11 mm. long----- *Cooperia nodulosa*.
Spicules not over 300μ long and without toothlike structures----- 6.
6. Spicules less than 200μ in length----- 7.
Spicules more than 200μ in length----- 8.
7. Branches of dorsal ray curved to form a lyre-shaped structure; spicules 135 to 185μ long; vulva with transverse slit; male 4.6 to 7.3 mm. long; female 5.4 to 7.8 mm. long----- *Cooperia curticei*.
Branches of dorsal ray nearly straight, almost parallel; spicules 120 to 150μ long; vulva crescentic in shape, elongated longitudinally----- *Cooperia punctata*.
8. Spicules 224 to 240μ long; vulva covered by a large linguiform process; male 7.2 to 7.8 mm. long; female 8 to 9.5 mm. long----- *Cooperia bisonis*.
Spicules 240 to 300μ long; vulva not covered by a linguiform process----- 9.
9. Main branches of dorsal ray widely divergent, forming U-shaped arch with cleft tips; spicules 240 to 300μ long; terminal portion of female with annular striations; combined lengths of muscular ovejectors about 700μ ; male 5.5 to 9 mm. long; female 6 to 8 mm. long----- *Cooperia oncophora*.
Main branches of dorsal ray close together and parallel, with uncleft tips; spicules 240 to 300μ long, with corrugated edge in middle third; terminal portion of female sharply pointed and not marked with annular striations; combined lengths of muscular portions of ovejectors about 300μ ; male 7 mm. long; female 7.5 to 9 mm. long----- *Cooperia pectinata*.

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EXPLANATION OF PLATE

Cooperia nodulosa, new species

Fig. 1. Anterior portion.

2. Male bursa.

3. Male bursa showing dorsal ray.

4. Spicules.

5. Female showing region of vulva.

6. Female tail.

a., anus.

d., dorsal ray.

e. d., externo-dorsal ray.

e. l., externo-lateral ray.

l. v., latero-ventral ray.

m. l., medio-lateral ray.

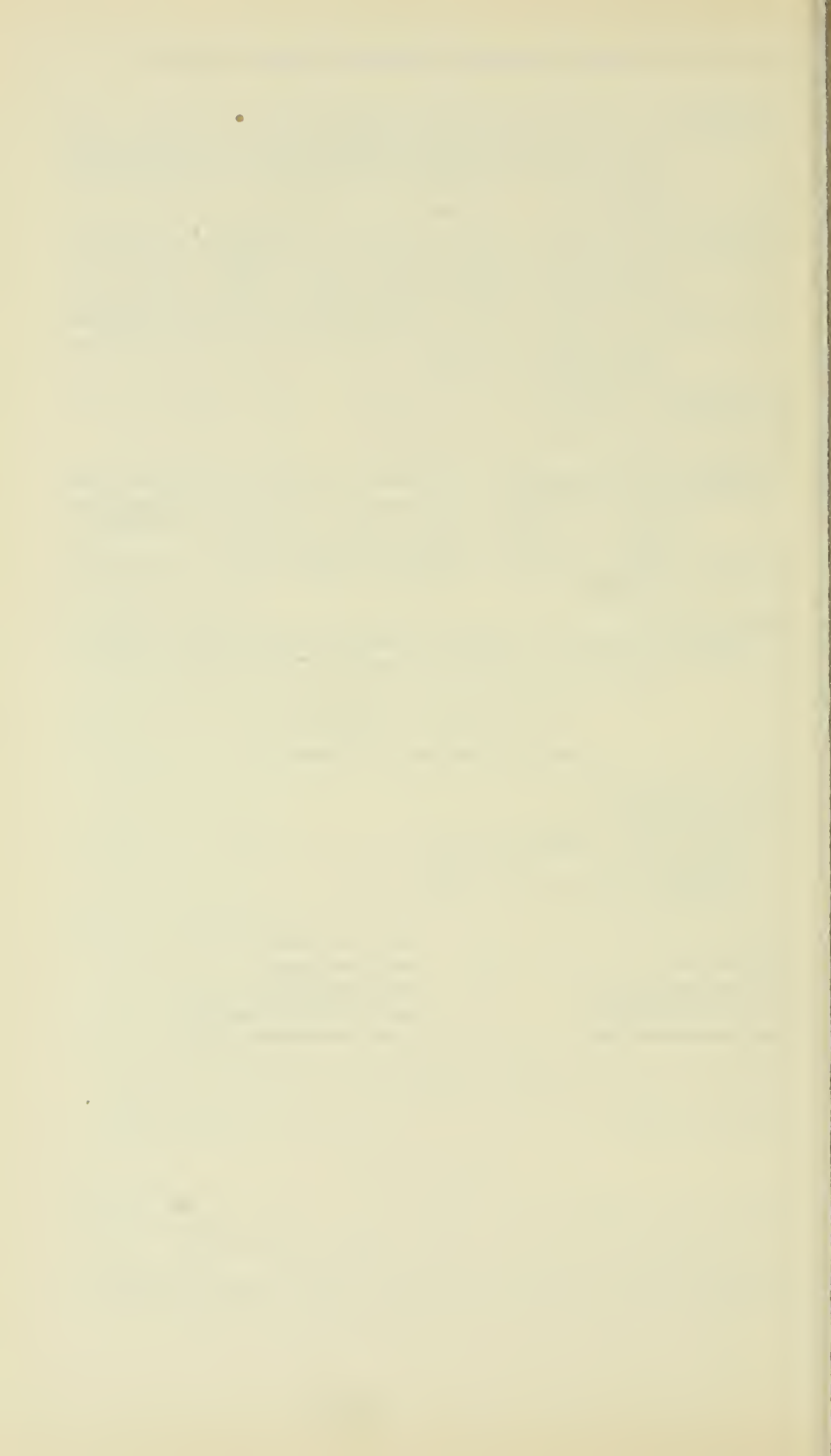
n. r., nerve ring.

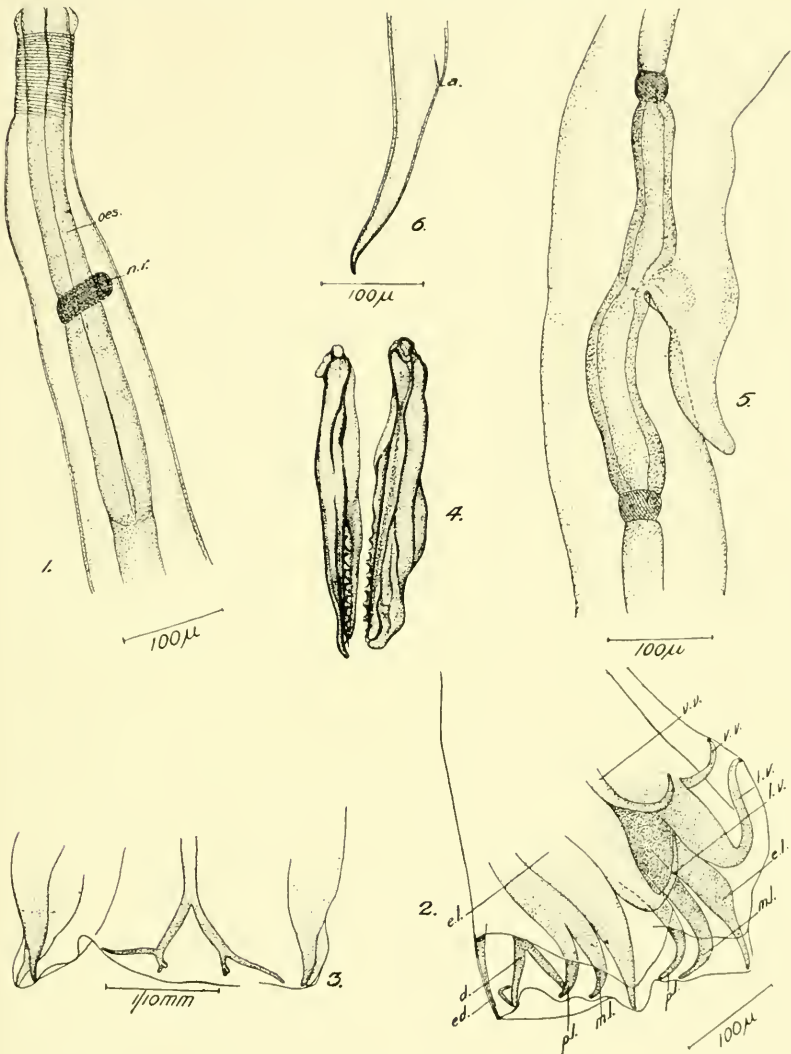
oes., esophagus.

p. l., postero-lateral ray.

v. v., ventro-ventral ray.

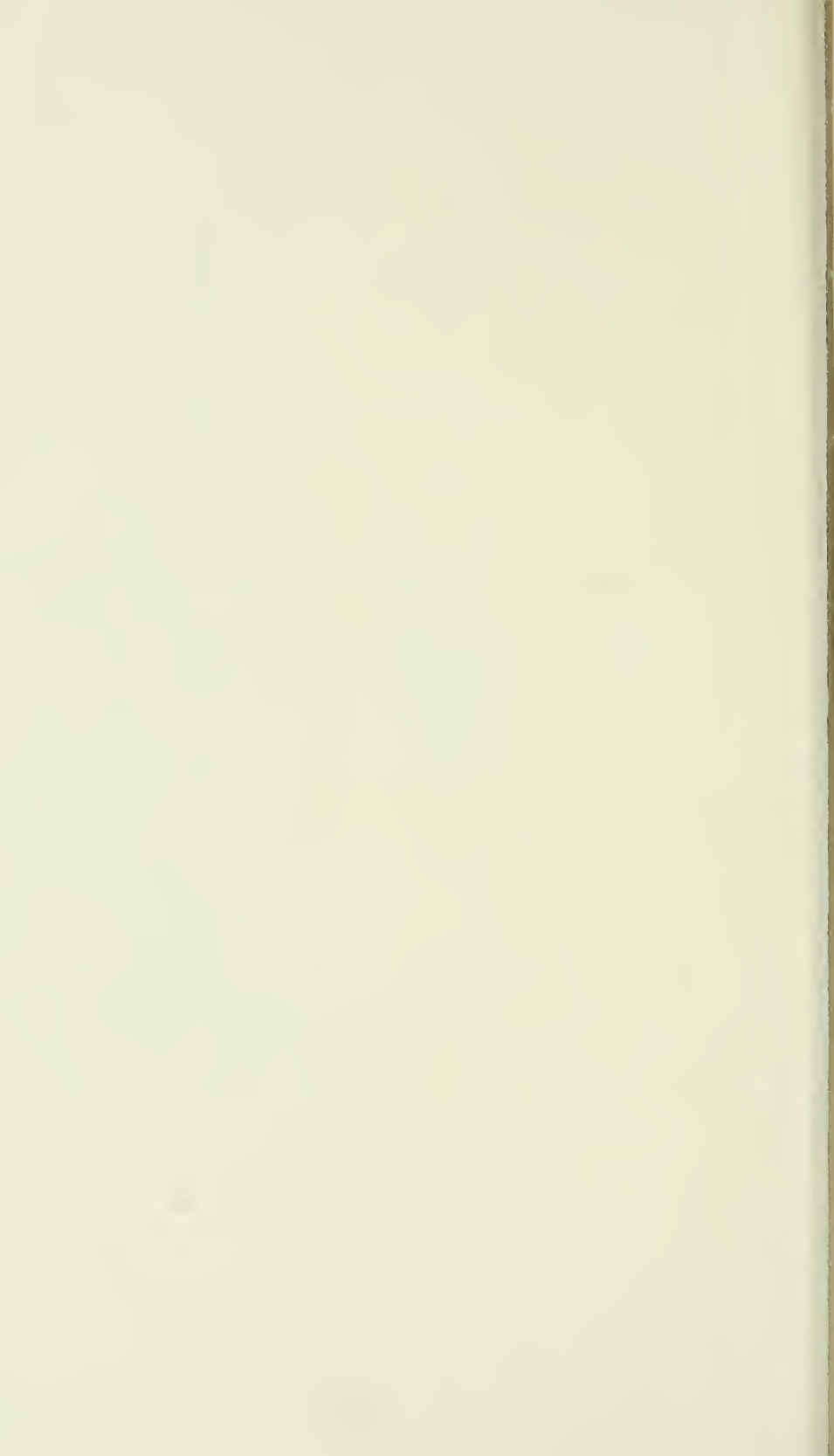






COOPERIA NODULOSA, NEW SPECIES

FOR EXPLANATION OF PLATE SEE PAGE 5



MIARGYRITE SILVER ORE FROM THE RANDSBURG DISTRICT, CALIFORNIA

By EARL V. SHANNON

Assistant Curator of Geology, United States National Museum

INTRODUCTION

Miargyrite, one of the rarest of the sulphantimonites of silver crystallizing in the monoclinic system, has the formula $\text{Ag}_2\text{S} \cdot \text{Sb}_2\text{S}_3$. It has been found in the United States only in the Flint and Silver City districts in Owyhee County, Idaho,¹ and in the Randsburg district of California.² In the latter district it has been abundant in the bonanza silver ores lately worked by the California Rand Mining Co. Shortly after the discovery of the rich silver ores of these mines an excellent series of specimens was obtained for the National Museum by Frank L. Hess. These specimens form the basis for the following description.

Although the Randsburg district has been prospected since the sixties and has been an active mining region since 1893, the rich silver ores were not discovered until April 12, 1919.³ The original outcrop of the ore was on the Juanite claim, only about 30 feet from a well-traveled road about 2 miles southeast of the town of Randsburg. The ore at the surface was very rich and all of the material mined was shipped to the smelter, leaving the mine literally without a dump. The specimens received by the United States National Museum are labeled as from the Kelly mine, which is one of the compact group now included in the California Rand properties.

There are a number of veins belonging to two systems that are rather complex in their relationships. The country rock consists of mica-albite and amphibole schists of pre-Cambrian age. Only two of the numerous silver veins outcropped, and one of these two is too low grade to be worked at a profit. The original discovery was made on the Shaft vein at the only point at which it came to

¹ Earl V. Shannon. The Minerals of Idaho. Bull. U. S. Nat. Mus. 131, pp. 148-150, 1926; Miargyrite and Tetrahedrite from the Flint District, Idaho. Amer. Min., vol. 13, No. 1, pp. 18-21, January, 1928.

² Arthur S. Eakle. Minerals of California. Calif. State Mining Bureau Bull. 91, p. 70, 1923, and Carlton D. Hulin. Geology and Ore Deposits of the Randsburg Quadrangle of California. Calif. State Mining Bureau Bull. 95, 1925.

³ Hulin. Geology and Ore Deposits of the Randsburg Quadrangle of California, p. 103.

the surface and the surface ore was very rich, assaying 300 ounces of silver and 3 ounces of gold to the ton. Adjacent to the veins the schists are commonly rather highly altered and frequently silicified and cut by veinlets of silica and pyrite. The walls of the veins are more or less indefinite and gradational.⁴

ORES

The richest specimens at hand consist of massive silver minerals, somewhat fractured and traversed by thin fillings of quartz. These contain a few cavities lined by crystals of miargyrite over which there may or may not be a discontinuous coating of clayey substance. The massive material consists principally of massive miargyrite. Hulin writes that miargyrite is the most abundant and important silver mineral of the region, but that stylotypite is only slightly less important. He says that the latter mineral is not apparent in the hand specimens, since it ordinarily occurs in minute irregular or rounded grains, commonly microscopic in size, which are usually entirely surrounded by miargyrite. The stylotypite is further almost invariably associated with chalcopyrite and occasionally with argentiferous bornite. Hulin defines stylotypite as a silver-bearing bournonite with the formula $3(\text{Cu}_2, \text{Ag}_2, \text{Fe})\text{S.Sb}_2\text{S}_3$, which is the formula given for this mineral by Dana. It was identified by him in polished surfaces under reflected light and is described as brittle, metallic, dark gray in color, and with a black streak. Microchemical and blowpipe tests indicated the presence of silver, iron, antimony, and sulphur in the Randsburg mineral. On polished sections it is faintly gray and slightly lighter in color than the miargyrite.

Wherry and Foshag⁵ give as the formula for stylotypite simply $3\text{Cu}_2\text{S.Sb}_2\text{S}_3$. Since the composition of this mineral is so incompletely known it was hoped that enough of the Randsburg material could be obtained for analysis. The coarse-grained massive high-grade ore was sawed and polished and etched on the polished surface with nitric acid. It was found to consist almost entirely of miargyrite which was unattacked by the nitric acid. There was present, however, a little interstitial material which etched bronzy and probably is the mineral identified as stylotypite by Hulin, but it was in such small amount and so intergrown with miargyrite as to render the separation of a portion for analysis impracticable.

The majority of the specimens of the lot consists of a breccia of fragments of dark gray fine-grained siliceous material the open interstices of which are lined with a layer of white quartz covered with a druse of minute transparent quartz crystals. It is resting upon the

⁴ Hulin. *Geology and Ore Deposits of the Randsburg Quadrangle of California*, p. 112.

⁵ Edgar T. Wherry and W. F. Foshag. *A New Classification of the Sulphosalt Minerals*. *Journ. Wash. Acad. Sci.*, vol. 11, No. 1, pp. 1-8, January, 1921.

quartz crystals in these vugs that the best crystals of miargyrite are found, although other less perfect crystals line the vugs in massive miargyrite. Hulin notes that small amounts of arsenopyrite, pyrite, pyrargyrite, proustite, chalcopyrite, argentiferous bornite, and stibnite also occur in the ore, but in the specimens at hand these minerals are not conspicuous and do not present any features worthy of special note. Green chromiferous mica is reported to occur rarely in altered wall rock in the outcrop of the Footwall vein.

The paragenesis of the minerals has been discussed in detail by Hulin. The stylotypite (?) is in part contemporaneous with quartz and is older than miargyrite, which sometimes replaces it. The order of genesis of the several minerals is given as:

A. Primary:

1. Silica (chalcedony and quartz).
2. Pyrite.
3. Arsenopyrite.
4. Stylotypite.
5. Chalcopyrite.
6. Argentiferous bornite.
7. Miargyrite.
8. Pyrargyrite.
9. Proustite.
10. Stibnite.
11. Calcite.

B. Secondary:

12. Secondary sulphides.
13. Cerargyrite.
14. Melanterite.

The following metallographic properties and reactions which are obtained on polished sections of the miargyrite are the characteristic ones for the species:

Color in section: Gray with red internal reflections in places.

Anisotropism: Strong.

Color in powder: Dark ruby red, distinctly darker than pyrargyrite.

1:1 HNO₃: Negative.

1:1 HCl: Fumes tarnish; in places negative.

20 per cent KCN: Slowly stains brown.

20 per cent FeCl₃: Negative.

40 per cent KOH: Stains iridescent.

5 per cent HgCl₂: Negative.

Since it was not desired to sacrifice the well-crystallized specimens by removing crystals enough to analyze, the analyzed material was taken from a coarse-grained massive specimen. (Cat. U.S.N.M. No. 95334.) By boring shallow pits in the centers of large and pure grains of miargyrite on polished surfaces 0.2 gram of pure sample was obtained. This was analyzed in the Museum laboratory with the following results:

Analysis of miargyrite from Randsburg, Calif.

Earl V. Shannon, analyst

	Found	Theory
Insoluble.....	0. 80	-----
Silver.....	36. 20	36. 90
Copper.....	. 02	-----
Iron.....	. 56	-----
Lead.....	. 95	-----
Antimony.....	42. 46	41. 20
Arsenic.....	Trace.	-----
Sulphur.....	19. 27	21. 90
	100. 26	100. 00

This analysis shows that the mineral is normal miargyrite, free from unusual constituents. It is a mineral of relatively low silver content as compared with the other silver minerals, with red streak which are commonly called ruby silver, and include proustite, pyrargyrite, and polybasite.

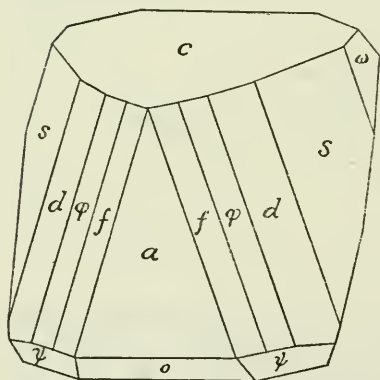
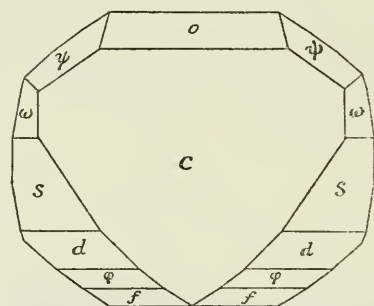


FIG. 1.—CRYSTAL OF MIARGYRITE THICK TABULAR ON c (001)

The crystals of miargyrite occur either lining cavities in the massive mineral or implanted on the drusy quartz of the vugs in the breccia ore. They are very brilliant black in color but tend to tarnish and become iridescent in the air. None of those in the specimens at hand are large, the most of them being between 1 and 3 millimeters in diameter. They occur singly or in small clusters grown together in haphazard fashion. No recognizable twins were found.

This mineral is monoclinic in crystallization and crystals from all localities are characterized by a rather peculiar general habit, being thick tabular parallel to the base c (001) with a predominance of faces lying in the zone between the front pinacoid a (100) and the side dome (011). This is especially true of the Randsburg material. This habit

makes the crystals very hard to orient. Although the basal pinacoid is usually present, this is inclined to the pole. The a (100) pinacoid is the only face developed in the prismatic zone and this is usually

so striated as to give very poor signals. Even when the correct orientation is known, this habit makes very precise adjustment on the goniometer almost impossible. Moreover, most of the crystals appear to have been fractured through the center, and the halves, although firmly recemented, are displaced a degree or more with reference to each other.

The crystal illustrated in Figure 1 (crystal 1993) is from the specimen (Cat. No. 95334) of massive miargyrite which furnished the material for analysis. It is typical of those occurring in the vugs in massive ore, although the larger of these are deeply striated and grooved and, being crowded and grown flat against the walls of the cavity, are seldom completely developed. These are somewhat simpler in habit and show a less number of forms than those resting upon quartz druses. This crystal gave the following measurements:

Measurements of miargyrite crystal, Figure 1

Form		Symbol		Quality description	Measured		Calculated	
No.	Letter	Gdt.	Miller		φ	ρ	φ	ρ
1	<i>c</i>	0	001	Fair.....	91 51	8 32	90 00	8 37
2	<i>a</i>	$\infty 0$	100	Good.....	90 00	90 00	90 00	90 00
3	<i>O</i>	-10	$\bar{1}01$	Fair.....	90 03	39 31	90 00	39 43
4	<i>A</i>	+1	111	-----do-----	22 03	71 43	21 18	72 15
5	<i>A</i>	+1	111	-----do-----	22 05	72 13	21 18	72 15
6	<i>S</i>	+21	211	Good.....	36 01	74 26	36 03	74 28
7	<i>S</i>	+21	211	P. blurred.....	35 28	73 53	36 03	74 28
8	<i>d</i>	+31	311	Good, dim.....	45 48	77 07	46 49	76 46
9	<i>f</i>	$+\frac{9}{2}1$	922	-----do-----	59 12	77 30	57 32	79 33
10	φ	+41	411	V. dim, end of zone.	50 57	78 32	54 31	78 43
11	ψ	$-\frac{41}{33}$	413	Poor, dim.....	49 39	56 11	50 03	56 30
12	ψ	$-\frac{41}{33}$	413	-----do-----	50 48	56 11	50 03	56 30

All of the crystals are strongly striated in two zones. The most prominent set of striations is parallel to the intersections of the faces in the zone 100:011 and the faces of this zone are often rounded by oscillation between the various forms in this zone with many vicinal forms. The striation is more marked in the end of the zone toward the front pinacoid and diminishes toward the opposite end, the form (011) being usually brilliant. Another less prominent series of striae occurs in the zone (100):(001). These two sets of striations are both present on the a (100) face and this together with the triangular or inverted keystone shape of the face serves to identify it and to orient the crystal.

The crystals implanted on the druses of quartz are somewhat more highly modified and vary from those which are thick tabular parallel to the front pinacoid to some which are

FIG. 2.—CRYSTAL OF MIARGYRITE THICK TABULAR ON a (100)

tabular parallel to the base. Every gradation exists between these two types. The former is illustrated in Figure 2. This crystal gave the following measurements:

Measurements of miargyrite crystal, Figure 2

Form		Symbol		Quality description	Measured		Calculated	
No.	Letter	Gdt.	Miller		φ	ρ	φ	ρ
1	c	0	001	Striated, blurred---	90° 01'	8° 00'	90° 00'	8° 37'
2	a	$\infty 0$	100	Good-----	90 01	90 00	90 00	90 00
3	a	$\infty 0$	100	Excellent-----	89 41	90 01	90 00	90 00
4	ω	01	011	Good, minute-----	3 42	70 48	2 59	71 06
5	o	-10	$\bar{1}01$	Excellent-----	$\overline{89}$ 55	39 56	$\overline{90}$ 00	39 43

Measurements of miargyrite crystal, Figure 2—Continued

Form		Symbol		Quality description	Measured		Calculated	
No.	Letter	Gdt.	Miller		φ	ρ	φ	ρ
6	X	$+\frac{1}{2}1$	122	Excellent-----	$\begin{smallmatrix} 21 & 32 \end{smallmatrix}$	$\begin{smallmatrix} 71 & 53 \end{smallmatrix}$	$\begin{smallmatrix} 19 & 48 \end{smallmatrix}$	$\begin{smallmatrix} 72 & 05 \end{smallmatrix}$
7	X	$+\frac{1}{2}1$	122	-----do-----	$\begin{smallmatrix} 21 & 18 \end{smallmatrix}$	$\begin{smallmatrix} 72 & 06 \end{smallmatrix}$	$\begin{smallmatrix} 19 & 48 \end{smallmatrix}$	$\begin{smallmatrix} 72 & 05 \end{smallmatrix}$
8	s	+21	211	-----do-----	$\begin{smallmatrix} 38 & 05 \end{smallmatrix}$	$\begin{smallmatrix} 74 & 39 \end{smallmatrix}$	$\begin{smallmatrix} 36 & 03 \end{smallmatrix}$	$\begin{smallmatrix} 74 & 28 \end{smallmatrix}$
9	s	+21	211	Medium-----	$\begin{smallmatrix} 36 & 00 \end{smallmatrix}$	$\begin{smallmatrix} 74 & 04 \end{smallmatrix}$	$\begin{smallmatrix} 36 & 03 \end{smallmatrix}$	$\begin{smallmatrix} 74 & 28 \end{smallmatrix}$
10	new?	$+\frac{7}{2}1$	722	Excellent-----	$\begin{smallmatrix} 49 & 05 \end{smallmatrix}$	$\begin{smallmatrix} 76 & 43 \end{smallmatrix}$	$\begin{smallmatrix} 50 & 59 \end{smallmatrix}$	$\begin{smallmatrix} 77 & 48 \end{smallmatrix}$
11	d	+31	311	-----do-----	$\begin{smallmatrix} 47 & 16 \end{smallmatrix}$	$\begin{smallmatrix} 76 & 42 \end{smallmatrix}$	$\begin{smallmatrix} 46 & 49 \end{smallmatrix}$	$\begin{smallmatrix} 76 & 46 \end{smallmatrix}$
12	d	+31	311	-----do-----	$\begin{smallmatrix} 47 & 45 \end{smallmatrix}$	$\begin{smallmatrix} 76 & 43 \end{smallmatrix}$	$\begin{smallmatrix} 46 & 49 \end{smallmatrix}$	$\begin{smallmatrix} 76 & 46 \end{smallmatrix}$
13	ϵ	$+\frac{5}{2}1$	522	Good-----	$\begin{smallmatrix} 42 & 17 \end{smallmatrix}$	$\begin{smallmatrix} 75 & 32 \end{smallmatrix}$	$\begin{smallmatrix} 41 & 53 \end{smallmatrix}$	$\begin{smallmatrix} 75 & 39 \end{smallmatrix}$
14	η	+61	611	-----do-----	$\begin{smallmatrix} 63 & 42 \end{smallmatrix}$	$\begin{smallmatrix} 80 & 56 \end{smallmatrix}$	$\begin{smallmatrix} 64 & 18 \end{smallmatrix}$	$\begin{smallmatrix} 81 & 32 \end{smallmatrix}$
15	η	+61	611	Poor-----	$\begin{smallmatrix} 65 & 23 \end{smallmatrix}$	$\begin{smallmatrix} 82 & 00 \end{smallmatrix}$	$\begin{smallmatrix} 64 & 18 \end{smallmatrix}$	$\begin{smallmatrix} 81 & 32 \end{smallmatrix}$
16	k	$+\frac{11}{42}$	124	Very poor-----	$\begin{smallmatrix} 16 & 29 \end{smallmatrix}$	$\begin{smallmatrix} 56 & 32 \end{smallmatrix}$	$\begin{smallmatrix} 15 & 19 \end{smallmatrix}$	$\begin{smallmatrix} 56 & 27 \end{smallmatrix}$
17	G	$+\frac{1}{5}0$	105	V. p. stri-----	$\begin{smallmatrix} 90 & 09 \end{smallmatrix}$	$\begin{smallmatrix} 16 & 37 \end{smallmatrix}$	$\begin{smallmatrix} 90 & 00 \end{smallmatrix}$	$\begin{smallmatrix} 19 & 13 \end{smallmatrix}$
18	ξ	$\frac{21}{33}$	$\bar{2}13$	P. blurred-----	$\begin{smallmatrix} \overline{30} & 35 \end{smallmatrix}$	$\begin{smallmatrix} 48 & 19 \end{smallmatrix}$	$\begin{smallmatrix} \overline{27} & 25 \end{smallmatrix}$	$\begin{smallmatrix} 47 & 32 \end{smallmatrix}$
19	ξ	$\frac{21}{33}$	$\bar{2}13$	-----do-----	$\begin{smallmatrix} \overline{30} & 17 \end{smallmatrix}$	$\begin{smallmatrix} 48 & 19 \end{smallmatrix}$	$\begin{smallmatrix} \overline{27} & 25 \end{smallmatrix}$	$\begin{smallmatrix} \overline{47} & 32 \end{smallmatrix}$

The only face which can not be reasonably referred to an established form is:

No. 10. Measured-----	$\begin{smallmatrix} \circ & ' \\ \varphi=49 & 05 \end{smallmatrix}$	$\begin{smallmatrix} \circ & ' \\ \rho=76 & 43 \end{smallmatrix}$
722 calculated-----	$\begin{smallmatrix} 50 & 59 \end{smallmatrix}$	$\begin{smallmatrix} 77 & 48 \end{smallmatrix}$
Difference-----	$\Delta= 1 \quad 54$	$\Delta= 1 \quad 05$

These crystals vary gradually to the general type shown in Figure 3, in which the front pinacoid is reduced to a small face and the crystal is distinctly tabular parallel to the basal pinacoid c (001). The crystal of this type measured gave the angles:

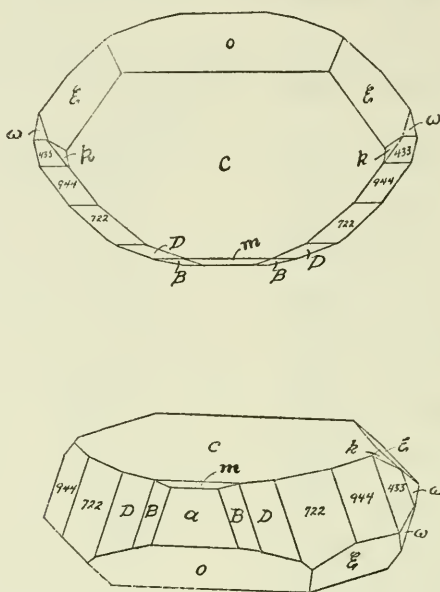


FIG. 3.—CRYSTAL OF MIARGYRITE TABULAR ON c (001)

Measurements of miargyrite crystal, Figure 3. (Lab. No. 1992)

Form		Symbol		Quality description	Measured		Calculated	
No.	Letter	Gdt.	Miller		φ	ρ	φ	ρ
1	c	0	001	Stri., double.....	89 55	90 53	90 00	8 37
2	a	$\infty 0$	100	P. blurr.....	90 40	91 00	90 00	90 00
3	m	+10	101	V. v. p. line.....	91 23	48 36	90 00	48 37
4	o	-10	$\bar{1}01$	Med. blurred.....	$\bar{9}1$ 00	38 09	$\bar{9}0$ 00	39 43
5	ω	01	011	Good.....	2 48	70 30	2 59	71 06
6	ω	01	011	Med. blurred.....	2 49	70 20	2 59	71 06
7	D	+71	711	Narrow line.....	68 34	82 21	67 31	82 31
8	New?	$+\frac{7}{2}1$	722	P. end of zone.....	48 09	77 46	50 59	77 48
9	New?	$+\frac{7}{2}1$	722	Excellent.....	50 18	77 16	50 59	77 48

Measurements of miargyrite crystal, Figure 3—Continued

Form		Symbol		Quality description	Measured		Calculated	
No.	Letter	Gdt.	Miller		φ	ρ	φ	ρ
10	New?	$+\frac{7}{3}1$	733	Excellent-----	$\begin{smallmatrix} 37 & 53 \end{smallmatrix}$	$\begin{smallmatrix} 75 & 16 \end{smallmatrix}$	$\begin{smallmatrix} 40 & 02 \end{smallmatrix}$	$\begin{smallmatrix} 75 & 15 \end{smallmatrix}$
11	New?	$+\frac{7}{3}1$	733	Good-----	$\begin{smallmatrix} 39 & 25 \end{smallmatrix}$	$\begin{smallmatrix} 74 & 38 \end{smallmatrix}$	$\begin{smallmatrix} 40 & 02 \end{smallmatrix}$	$\begin{smallmatrix} 75 & 15 \end{smallmatrix}$
12	New?	$+\frac{4}{3}1$	433	Excellent-----	$\begin{smallmatrix} 24 & 45 \end{smallmatrix}$	$\begin{smallmatrix} 72 & 15 \end{smallmatrix}$	$\begin{smallmatrix} 26 & 41 \end{smallmatrix}$	$\begin{smallmatrix} 72 & 56 \end{smallmatrix}$
13	New?	$+\frac{4}{3}1$	433	-----do-----	$\begin{smallmatrix} 24 & 59 \end{smallmatrix}$	$\begin{smallmatrix} 72 & 15 \end{smallmatrix}$	$\begin{smallmatrix} 26 & 41 \end{smallmatrix}$	$\begin{smallmatrix} 72 & 56 \end{smallmatrix}$
14	B	+15. 1	15.1.1	Poor, rounded-----	$\begin{smallmatrix} 78 & 18 \end{smallmatrix}$	$\begin{smallmatrix} 86 & 00 \end{smallmatrix}$	$\begin{smallmatrix} 78 & 57 \end{smallmatrix}$	$\begin{smallmatrix} 86 & 14 \end{smallmatrix}$
15	k	$+\frac{11}{42}$	124	Good-----	$\begin{smallmatrix} 19 & 30 \end{smallmatrix}$	$\begin{smallmatrix} 56 & 34 \end{smallmatrix}$	$\begin{smallmatrix} 15 & 19 \end{smallmatrix}$	$\begin{smallmatrix} 56 & 27 \end{smallmatrix}$
16	k	$+\frac{11}{42}$	124	-----do-----	$\begin{smallmatrix} 18 & 07 \end{smallmatrix}$	$\begin{smallmatrix} 57 & 05 \end{smallmatrix}$	$\begin{smallmatrix} 15 & 19 \end{smallmatrix}$	$\begin{smallmatrix} 56 & 27 \end{smallmatrix}$
17	ξ	$-\frac{21}{33}$	$\bar{2}13$	Medium-----	$\begin{smallmatrix} 28 & 44 \end{smallmatrix}$	$\begin{smallmatrix} 47 & 34 \end{smallmatrix}$	$\begin{smallmatrix} 27 & 25 \end{smallmatrix}$	$\begin{smallmatrix} 47 & 32 \end{smallmatrix}$
18	ξ	$-\frac{21}{33}$	$\bar{2}13$	Poor, mult-----	$\begin{smallmatrix} 25 & 16 \end{smallmatrix}$	$\begin{smallmatrix} 47 & 34 \end{smallmatrix}$	$\begin{smallmatrix} 27 & 25 \end{smallmatrix}$	$\begin{smallmatrix} 47 & 32 \end{smallmatrix}$

Of the faces measured on this crystal three forms, represented by two faces each, are apparently new, although the quality of the faces is such that it can not be positively asserted the indices derived for these are correct. They are:

No. 8-----	$\varphi = \begin{smallmatrix} 48 & 09 \end{smallmatrix}$	$\rho = \begin{smallmatrix} 77 & 46 \end{smallmatrix}$
No. 9-----	$\begin{smallmatrix} 50 & 18 \end{smallmatrix}$	$\begin{smallmatrix} 77 & 16 \end{smallmatrix}$
Average-----	$\begin{smallmatrix} 49 & 14 \end{smallmatrix}$	$\begin{smallmatrix} 77 & 31 \end{smallmatrix}$
722 calculated-----	$\begin{smallmatrix} 50 & 59 \end{smallmatrix}$	$\begin{smallmatrix} 77 & 48 \end{smallmatrix}$
Difference-----	$\Delta = \begin{smallmatrix} 1 & 45 \end{smallmatrix}$	$\Delta = \begin{smallmatrix} 0 & 17 \end{smallmatrix}$
No. 10-----	$\varphi = \begin{smallmatrix} 37 & 53 \end{smallmatrix}$	$\rho = \begin{smallmatrix} 75 & 16 \end{smallmatrix}$
No. 11-----	$\begin{smallmatrix} 39 & 25 \end{smallmatrix}$	$\begin{smallmatrix} 74 & 38 \end{smallmatrix}$
Average-----	$\begin{smallmatrix} 38 & 39 \end{smallmatrix}$	$\begin{smallmatrix} 74 & 57 \end{smallmatrix}$
733 calculated-----	$\begin{smallmatrix} 40 & 02 \end{smallmatrix}$	$\begin{smallmatrix} 75 & 15 \end{smallmatrix}$
Difference-----	$\Delta = \begin{smallmatrix} 1 & 23 \end{smallmatrix}$	$\Delta = \begin{smallmatrix} 0 & 18 \end{smallmatrix}$
No. 12-----	$\varphi = \begin{smallmatrix} 24 & 45 \end{smallmatrix}$	$\rho = \begin{smallmatrix} 72 & 15 \end{smallmatrix}$
No. 13-----	$\begin{smallmatrix} 24 & 59 \end{smallmatrix}$	$\begin{smallmatrix} 72 & 15 \end{smallmatrix}$
Average-----	$\begin{smallmatrix} 24 & 52 \end{smallmatrix}$	$\begin{smallmatrix} 72 & 15 \end{smallmatrix}$
433 calculated-----	$\begin{smallmatrix} 26 & 41 \end{smallmatrix}$	$\begin{smallmatrix} 72 & 56 \end{smallmatrix}$
Difference-----	$\Delta = \begin{smallmatrix} 1 & 49 \end{smallmatrix}$	$\Delta = \begin{smallmatrix} 0 & 41 \end{smallmatrix}$

The recognition of the crystal form of a "ruby silver" mineral may be of importance in identifying the mineral and consequently in estimating the probable silver content of the ore. The crystals of miargyrite (36.9 per cent silver) are readily distinguished from those of pyrargyrite (59.9 per cent silver), proustite (65.4 per cent silver), and polybasite (75.6 per cent silver). All of these have a red streak and pass under the name ruby silver.



TWO NEW FROGS FROM JAMAICA

By EMMETT REID DUNN

When in Jamaica in 1925 I saw very little of the southeastern part of the island, which was known to differ somewhat from the rest, and to harbor a lizard, *Anolis lineatopus*, not found elsewhere.

Recently C. R. Orcutt has been collecting in that region, chiefly at Arntully, in St. Thomas Parish. There, besides *Anolis lineatopus*, he has taken a number of frogs, two of which are new and will be described hereinafter.

His frogs include, besides the new species, *Hyla brunnea*, *Eleutherodactylus luteolus*, and *E. grabhami*. The *luteolus* show marked approach to *nubicola* of the higher Blue Mountains and make it appear best to regard the latter, as well as *gossei* of the western mountains, as subspecies of *luteolus*. The *grabhami* include adult females which reach a length of 34 mm.

The two new frogs are related to *E. jamaicensis* Barbour, and perhaps through *E. montanus* of Hispaniola to the *auriculatus* group of Cuba, Hispaniola, Porto Rico, and the Lesser Antilles. The Jamaicans differ, however, in the absence of the coarse granulations of the belly which the frogs of this group have in the other islands. The two new ones differ from all Antillean or other *Eleutherodactylus* in the extent of webbing of the toes.

ELEUTHERODACTYLUS ORCUTTI, new species

Type.—Cat. No. 73866, U.S.N.M., adult female. Paratypes: Nos. 73867–70, U.S.N.M.

Type locality.—Arntully, St. Thomas Parish, Jamaica.

Diagnosis.—An *Eleutherodactylus* with well-developed digital disks, small scattered warts above, smooth below, vomerine series medium, toes $\frac{2}{3}$ webbed, two phalanges of IV free; tympanum (of female) $\frac{3}{4}$ eye; of male equals eye.

Description.—Cat. No. 73866, U.S.N.M., adult female. Head as broad as long, broader than body; distance between anterior corner of eye and nostril less than diameter of eye, equal to interorbital

space, twice distance between nostril and snout; canthus rostralis blunt; lores feebly concave; tympanum $\frac{3}{4}$ the diameter of the eye, separated from the eye by half its own diameter; heels not meeting when appressed; heel reaches anterior corner of eye; disks of fingers and toes well developed; disk of finger III equals $\frac{1}{2}$ tympanum; toes webbed at base and fringed; toe IV with two phalanges free of web; no tarsal fold; two metatarsal tubercles; small irregular warts above; smooth below; vomerine teeth in short series beginning below inner corner of nares, separated from its fellow by half its own length; dark mottled gray above, light gray below; base and hind side of thigh light (yellow in life?); length, 38 mm.

Variation.—A male (Cat. No. 73867, U.S.N.M.), has the tympanum equal in diameter to the eye; mottling above in form of cross-bars; a light interocular bar; no light on thighs; length, 29 mm.

ELEUTHERODACTYLUS CUNCTATOR, new species

Type.—Cat. No. 73865, U.S.N.M., adult female.

Type locality.—Arntully, St. Thomas Parish.

Diagnosis.—An *Eleutherodactylus* with well-developed digital disks; smooth above and below; vomerine series medium; toes $\frac{1}{2}$ webbed, two phalanges of IV free; tympanum (of female) $\frac{1}{2}$ eye.

Description.—Cat. No. 73865, U.S.N.M., adult female. Head as long as broad, narrower than body; eye to nostril less than diameter of eye, equal to interorbital width, twice distance between nostril and snout; canthus rostralis blunt; lores feebly concave; tympanum $\frac{1}{2}$ eye; eye to tympanum nearly equal to tympanum; heels not meeting when appressed; heel reaches anterior corner of eye; disks of fingers and toes well developed; disk of finger III nearly equal to tympanum; toes webbed and fringed; web reaches to next to last joint of toe IV; no tarsal fold; two metatarsal tubercles; skin smooth above and below; a glandular line from upper eyelid obliquely down and back onto sides; vomerine teeth in two short series, beginning behind inner corner of nares, separated from its fellow by half its own length; black above, mottled obscurely with brown; grayish brown below; length, 37 mm.



MINERALOGY AND GEOLOGY OF CERRO MERCADO, DURANGO, MEXICO

By WILLIAM F. FOSHAG

Assistant Curator, United States National Museum

INTRODUCTION

Cerro Mercado, near Durango, contains Mexico's chief domestic supply of iron ore. The existence of these deposits has been known since 1552, and there have sprung up many fanciful estimates of their importance. The "Cerro" is still often referred to as "a mountain of iron," an exaggeration that rests upon old and superficial examinations. It is, however, a deposit of considerable magnitude, and this, together with its long history, invites attention and a number of descriptions of it have appeared. Most of these are brief and inaccurate. Bulletin No. 44 of the Instituto Geológico de Mexico "El Cerro de Mercado, Durango," however, is a detailed and important contribution upon which the present writer has freely drawn.

The present paper is based largely upon information collected during a summer of field work in 1926, during which time six days were spent on Cerro Mercado and a few days in the surrounding areas. The investigation was undertaken under the joint auspices of the United States National Museum and the Mineralogical Museum of Harvard University and was made possible by a grant from the Holden fund of the latter institution. The writer is deeply indebted to Prof. Charles Palache, of Harvard University, for his very kind interest in this work. Grateful acknowledgment must also be made to Señors Manuel Rangel, manager, and Garcia, mine superintendent, for the Compañía Fundidora de Fierro y Acero de Monterrey, S.A., at Durango, for the privilege of visiting the deposit and for furnishing much assistance and information relative to the ore occurrence; and to David J. D. Myers, American consul at Durango, for his interest in the investigation. Some questions of interest and importance have been left without adequate solution since the press of urgent business necessitated the immediate return of the writer to Washington after a week spent in Durango.

LOCATION

The city of Durango, capital of the State of Durango, is in the southern part of the State. Four railroad lines enter the city; one from the east joining the main line of the Mexican Central Railroad at Torreon; one in the west from Salta, a lumbering station in the Sierra Madre Mountains; another in the north from a mining district in the Sierras, Tepehuanes; and the last one in the southeast again connecting with the Mexican Central line at Canitas. The Salta line is planned to eventually extend to Mazatlan, a seaport on the Pacific coast; while the Tepehuanes branch will be advanced through the rich mining district of northern Durango and southern Chihuahua to Parral.

The city of Durango is located at the western edge of the valley of Guadiana, through which, about 8 kilometers from the city, flows the Rio Tunal. To the east and south lie rich meadows and ranches, while to the north and west the mountains rise step on step to the crest of the Sierra Madre Range. Looking from the town the two most important eminences are Cerro de los Remedios to the west and Cerro de Mercado to the north. One can also see, away to the south, the tilted pine-clad slope of Sierra Colorado. From the summit of Cerro de los Remedios the surrounding country can be scanned in all directions. To the east lie the city and the valley of Guadiana, to the west a series of smooth sloping benches—faulted volcanic flows rising step upon step. To the north are the farms of the valley, the low-lying lava flows of Cerro Sanctuario, and the abrupt slopes and ore cliffs of Cerro Mercado.

Cerro Mercado from the south appears as a long ridge with a steep and turreted mass of iron ore, Picacho de la Cruz at its eastern end and a gentler peak, Picacho Socavon 4, at its western end. Between these are two gentle domes of iron ore, Cordon Rangel to the west and Picacho Sur to the east. (Pl. 1.) The western slope is also steep, with Picacho Socavon 4 at the southern end and Picacho Socavon 2 at the northern end. The northern slopes are gentler and more irregular and melt away to the northward into a long ridge called El Pedrigoso. Cerro Mercado has a length of 1,500 meters and rises 175 meters above the valley floor.

At the time of the writer's visit (September) the hill was clothed in vegetation. On the southern slope, especially near the summit, grows an open grove of nopales (*Opuntia*), at that time in abundant fruit. These fruits, *tunas*, form an important article of food for many of the native inhabitants. At the base of the hill are a few scattered mesquite trees. The northern slope is bare of larger plant forms, although it is covered with small shrubs and especially with a mat of long grass, so thick as to almost completely mask the rocks

and to make progress and geological study difficult. About the foot of the Cerro are cultivated fields of beans or pasture lands.

HISTORY OF THE DEPOSIT

Shortly after Cortez had conquered Mexico and its environs he dispersed his captains to the outlying provinces of Mexico. One expedition leaving Acapulco invaded California, while others founded towns in Sonora, Sinaloa, and penetrated Zacatecas and New Mexico. All these expeditions brought back tales of the marvelous richness of the country, among which was a report of a mountain carrying abundant silver and gold. In 1552 the Governor of New Galicia (Jalisco) sent Genes Vasquez de Mercado to conquer the valley of Guadiana and investigate the reports of this mountain of silver and gold. Mercado procured the services of an Indian who assured him that he knew the place and after some days spent on the way arrived at the indicated hill, found no gold or silver, but a huge mass of iron ore; the search proving futile, Mercado began his return, but the band was attacked by hostile Indians, at which time Mercado was mortally wounded. In 1563 the town of Durango was established by Francisco de Ibarra.¹

The presence of so much iron ore led many, under the belief that it constituted a gossan, to prospect the hill for gold and silver, while its possibilities as a source of iron remained untouched until 1828, when an English company under the patronage of the Governor of Durango, constructed iron works on the banks of the Tunal River at a spot known as Piedras Azules. Prior to this, planters from the neighboring farms succeeded in smelting the ore from Cerro Mercado in simple Catalanian furnaces for the iron that they needed to cultivate their fields.²

In 1881 the Iron Mountain Co. was organized and established reduction works at the foot of the hill. In 1885 this company sold its holdings to the Mexican Iron Mountain Manufacturing Co. of Des Moines, and in 1888 it was again sold to the Durango Iron & Steel Co. During this period some iron was smelted with charcoal, but the high costs, especially of transportation, for the nearest railroad point was Torreon 150 miles to the east, made operations unprofitable.³

With the advent of the railroad to Durango and the acquisition of the iron deposits by the *Compañía Fundidora de Fierro y Acero de Monterrey*, the deposits were actively developed and under the direc-

¹ Fr. Francisco Frejes, *Historia breve de la Conquista de los Estados independientes del Imperio Mexicano*. Quoted by Frederico Weidner. *Annales del Ministerio de Fomento, Mexico*, vol. 3, p. 164, 1877.

² John Birkenbine, *Amer. Inst. Min. Engrs.*, vol. 13, pp. 196-7, 1884.

³ Private communication to the writer by John S. McCaughan, of Durango.

tion of Señor Manuel Rangel, became the chief iron ore producer of Mexico.

GENERAL GEOLOGY

The geology of the northern plateau region of Mexico falls into two main divisions: (1) Mesozoic sedimentary rocks with rare and scattered intrusions of granodiorite, diorite, and other injected forms, and (2) Tertiary volcanic flows and tuffs with minor areas of later sediments. Along the line of the Mexican Central Railroad both types are encountered, this being in a rough way the line of demarcation of those areas predominantly of Mesozoic rocks and those of Tertiary rocks. To the east Cretaceous sediments abound almost to the entire exclusion of the eruptive rocks of later age, while to the west the sedimentary formations rapidly give way to flows and tuffs of Tertiary age.

Along the railroad from Torreon to Durango limestone is prominently exposed and can be found at Torreon and for some distance to the west. At Velardena, limestone with intrusions of granodiorite, diorite, alaskite, and other rocks are abundant and Tertiary eruptive rocks cap many of the hills and ranges. Farther west the sediments become less and less prominent until at Durango they have given way entirely to rhyolite, latite, and tuff. From Durango west, across the Sierra Madre Range, the rocks are all eruptive and are largely rhyolitic in character. The Sierra Madre Mountains are built up of successive flows of eruptive lavas. On the east they lie directly upon folded slates; upon the west they overlie older andesite and more rarely granite. These eruptive rocks are capped in many places throughout the Sierra Madre by later basalts. The order of succession as given by Weed⁴ is (1) andesite, (2) trachyte, (3) granite, (4) dacite, (5) rhyolite, and (6) basalt.

The rocks in the immediate vicinity of Cerro Mercado are entirely volcanic and include, according to A. R. Martinez-Quintero,⁵ crystal tuff (Cerro Santuario and Cerros de los Presos), rhyolite tuff (Cerro de los Remedios, Cerro Frey Diego), lithoidal rhyolite (Cerro de los Remedios), lithophysal rhyolite (Cerro del Calvario) and latite (Cerro de San Antonio).

SPECIAL GEOLOGY

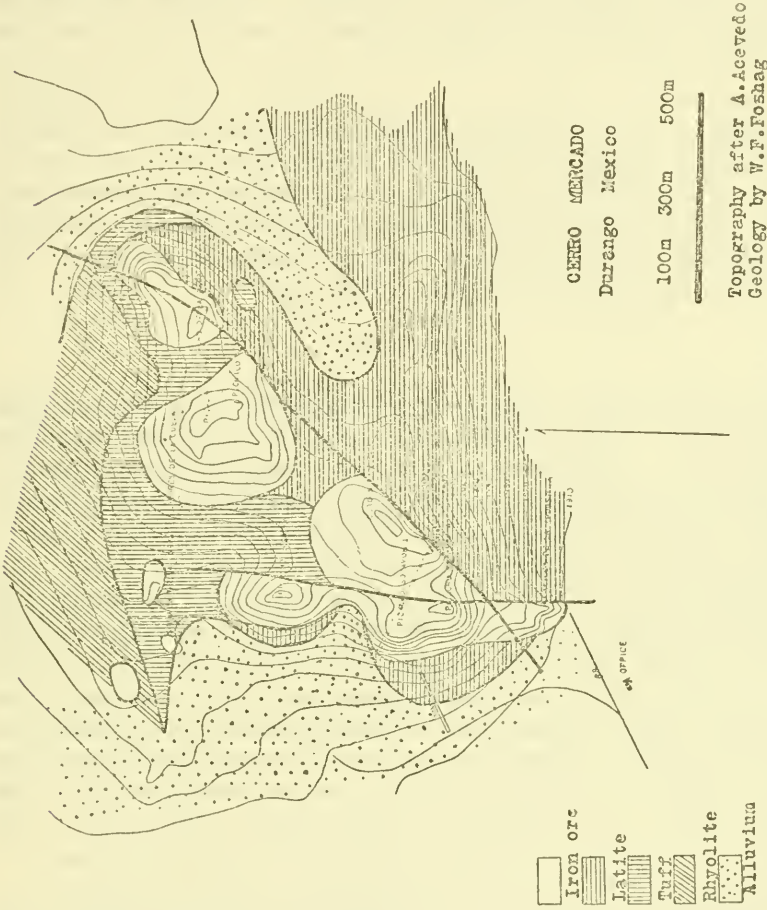
The rocks of Cerro Mercado can be divided into three types: (1) latite, (2) rhyolite tuff, and (3) rhyolite. (See fig. 1.) Of these latite is the lowest in the sequence, tuff intermediate, and rhyolite the topmost member. The latite is well exposed on the western and southern slopes to the crest of the hill but is absent from the northern

⁴ Amer. Inst. Min. Eng. Trans., vol. 32, p. 458, 1902.

⁵ El Cerro de Mercado, Durango, Bol. 44, Inst. Geol. Mexico, pp. 21-39, 1923.

slopes. It is uncovered by the excavation of the *tolva* on the western slope and can be conveniently studied there. About the ore bodies it is often altered to a pyroxenitic rock or strongly hydrated to a soft clayey mass that still retains its original structure.

Above the latite lies rhyolite tuff, fine grained or made up of fragments that do not greatly exceed 1 inch in size. This borders the hill



on the north and east with a small patch or two on the south slope below Picacho de la Cruz. This is well exposed by workings at the Socavon de la Cueva.

The rhyolite is confined to the lower northern slopes extending to an unknown distance to the north, where it follows the ridge of El Pedrigoso. Rhyolite also occurs in a small hill a short distance east of Cerro Mercado, known as Cerro del Almagre, and in another small hill a short distance south of the main mass.

Two main faults have been noted, although it is probable that there are more that are less evident. The more prominent fault strikes northeasterly, bordering the ore bodies of Cordon Rangel, Picacho Sur, and Picacho de la Cruz on the south and is responsible for the steep southern slope of the hill. This fault is postulated in large part upon physiographic evidence and upon the fact that the small patches of tuff at the foot of Picacho de la Cruz may be best explained as small down-faulted portions of the tuff of the northern slope.

A second fault strikes in an almost exactly northerly direction, bounding the iron-ore bodies of Picacho Socavons 4, 1, and 2 on the east and separating the ore body of Picacho Socavon 1 from that of Cordon Rangel. This fault has been encountered in Socavon 1 at a distance of 150 meters from its portal, where it abruptly terminates the ore body. The fault plane is sharp, without much slickensiding but with a considerable brecciation of the ore.

PETROLOGY

Latite.—The latite forms a fine-grained rock of a vinaceous gray color (92142).⁶ The groundmass is aphanitic, often with numerous irregular gas cavities that contain minute corroded quartz crystals or small plates of specular hematite. The phenocrysts, seldom exceeding 5 millimeters in length, are in part glassy feldspar and in part a feldspar partially or completely altered to sericite or kaolin. Another mineral that may be detected with a hand lens is iron ore, presumably magnetite, the result of the magmatic alteration of the pyroxene of the rock. No phenocrysts of quartz were observed. In thin sections of the rock the groundmass, while indistinctly birefracting in places, appears to be largely glass. Throughout this groundmass there are the usual numerous microlites, the larger ones being chiefly the magnetite residues of resorbed pyroxene. The phenocrysts are orthoclase with a small optical axial angle or feldspars now completely or partially altered to a birefracting mass. In the specimens studied most of the feldspar phenocrysts have the optical properties of orthoclase but smaller amounts are andesine. No twinning was noted in the plagioclase. Martinez-Quintero⁷ describes the latite as being somewhat variable in the proportion of its feldspars, some specimens having the orthoclase predominant, in others plagioclase is the chief feldspar. Besides the small altered pyroxene crystals in the groundmass there are numerous larger ones in the form of phenocrysts but the original mineral is now entirely destroyed leaving only magnetite. Near Pozo de Aguacera is a glassy

⁶ The numbers refer to the catalogue number of the specimens.

⁷ Inst. Geol. Mexico, Bol. 44, p. 23, 1923.

latite (92143) colored mottled brown and black, with prominent brownish feldspar phenocrysts up to 8 millimeters in size. The groundmass is a brown perlitic glass with very minute microlites. Throughout the groundmass are scattered phenocrysts of both orthoclase and plagioclase. The orthoclase is variable in its optical axial angle, in a few grains it is small but many have a large angle. The plagioclase is andesine. Twinning is not very prominent in the plagioclase but does occur in some grains as very fine striae. Augite is present in irregular to subhedral grains with a pleochroism of c =brownish green and a =brown.

Tuff.—The tuff ranges from buff-colored fine-grained rocks with a harsh feel to brick-red forms with fragments over 1 centimeter in size (92146). The original fragments are all strongly altered. Under the microscope the groundmass is amorphous except where it carries abundant secondary chalcedony as radiating globules or masses. The rock fragments are made up of a very fine birefracting substance thought to be montmorillonite or a similar clay mineral.

The finer grained tuff from the base of Picacho de la Cruz (92145) shows under the microscope a complete crystalline structure of interlocking grains of quartz, some bright-green grains of augite, a few flakes of muscovite, and rarely some feldspar. This tuff has undoubtedly been recrystallized and largely silicified.

Rhyolite.—The rhyolite (92144) forms a vinaceous to cinnamon-red rock with numerous glassy phenocrysts of quartz and smaller ones of feldspar in an aphanitic groundmass. Small grass-green augites occur in some of the more chalky streaks and are often arranged in small circular masses. The groundmass, as seen under the microscope, is made up of interlocking grains and apparently has been somewhat recrystallized and silicified. The chief constituents are quartz and orthoclase. In some parts the grass-green augite is abundant in thin veinlets. About these veinlets the rock is somewhat recrystallized. Hematite in thin hexagonal scales occurs rarely.

ROCK ALTERATIONS

The common type of wall-rock alteration is a "kaolinitization" and is often accompanied by the introduction of much diopside. This hydration is strongly developed in Socavon 4, after this adit has passed through the iron-ore body. The remainder of the adit is entirely in a completely altered latite. The texture of the original rock is well retained, the small feldspar phenocrysts are easily observable, but the entire mass is now hydrated to a soft claylike mineral. Under the microscope this mineral appears as matted small shreds with a strong birefringence and with a mean index of 1.49. A partial analysis of a sample of the pure mineral gave: Water

19.22, silica 51.20, alumina 16.15, giving an approximate alumina-silica ratio of 1:5. The mineral is therefore montmorillonite.⁸ Small patches of diopside are scattered through much of this material, or the diopside may be in such abundance that the resulting rock is largely this mineral. In much of this pyroxenized material the diopside is arranged in radiating groups. Small octahedrons of magnetite are scattered through the groundmass and some streaks carry abundant honey-yellow crystals of titanite. The groundmass often carries later gypsum in small clear cleavage plates and some dispersed calcite. Bluish-colored chalcedony is sometimes observed and there are also occasional masses and veins of quartz visible.

All gradations can be found from the slightly altered latite to almost pure diopside rock so that there can be little doubt concerning the nature and origin of this "pyroxenite." Plate 3 shows a breccia of latite partially replaced by the dark-colored diopside. The residual latite fragments are now largely altered to montmorillonite.

At the point called Labores de la Cueva a similar type of alteration is encountered. The brecciated character of the rock is well shown there. The dark-gray matrix of the fragments consists largely of calcite and magnetite. (Pl. 4.) Occasional crystals of diopside are observed and rarely crystals of zircon. There are small veins of calcite or vugs lined with the same mineral. The alteration of this type is similar to that of the latite described above, but pyroxenization is very much less pronounced and calcification much further advanced.

On the west slope of El Pedrigosa, immediately north of the main ridge of Cerro Mercado, the rhyolite is extensively silicified, usually with a complete obliteration of all structure of the original rock, though rarely containing some of the original quartz phenocrysts of the rhyolite. The material so silicified may be either compact and porcelainlike or it may be soft and friable or again hard and vuggy. Under the microscope the rock is fine grained and made up largely of small radiating spherulites of chalcedony, with the interstices filled with opal. Some quartz seems to be present, although the fine grain of the aggregate precludes its definite determination. Many of the individual grains are sharp cornered, suggesting that they may be pseudomorphous after some other mineral, perhaps calcite or adularia, but no unaltered mineral could be detected. This material is mined and used for siliceous furnace linings. It consists of 97.7 per cent silica and over 2 per cent water, with other constituents in very minor amounts.

⁸ The Minerals of Bentonite and Related Clays and Their Physical Properties. Clarence S. Ross and Earl V. Shannon. *Trans. Amer. Ceramic Soc.*, vol. 9, No. 2, pp. 77-96, 1926.

MINERALOGY

The mineralogy of the iron deposits of Cerro Mercado is comparatively simple. The iron minerals are in very large excess over the other minerals and consist almost entirely of the pseudomorphous variety of hematite known as martite. Other iron minerals are inconspicuous in the deposit; they may actually be said to be rare. Associated minerals are not abundant. The iron ore forms a mass of considerable purity and the accessory minerals are found only in the vugs and cracks of this ore.

In addition to the chief ore mineral, martite, there are also goethite and limonite; and the accessory minerals include apatite, dahllite, an unknown phosphate mineral, hedenbergite, sepiolite, quartz, chalcedony, opal (variety hyalite), titanite, calcite, and barite. Other minerals have been listed from this locality but some of them have certainly been erroneous determinations, while others, such as topaz, have come from neighboring localities but not from Cerro Mercado itself.

Martite.—All of the ore that is found in well-defined crystalline form belongs to the pseudomorphous variety of hematite called martite. This leads to the reasonable assumption that the massive material is of the same nature. At Penascos de la Industria it is hard and firm with numerous cavities lined with well-formed or flattened octahedral crystals (92151). Martite crystals up to 2 and 3 inches across have been found here. The octahedrons are frequently flattened and then resemble stout rhombohedral crystals of hematite. Twins among the flattened crystals are common; sometimes larger crystals show several smaller individuals in twinned position along the edges. In the finer grained ore of Picacho Socavon⁹ 1 (92160) one can readily distinguish the small constituent octahedrons of martite under the binocular microscope. A section of this under the petrographic microscope reveals the martite crystals arranged in delicate fernlike groups, suggestive in their arrangement but lacking the delicacy of the magnetite crystals that are found between lamellae of mica. Some of the harder lenses of this material (92161) have the same structure but owe their superior hardness to an impregnation of quartz and chalcedonic silica. The compact ore of Picacho Socavon 2 (92162) is also martite. It is firm and compact with a semimetallic luster. In some of the cavities, now lined with crystals of quartz, are to be found small brilliant modified octahedrons. Since they show no magnetism and have a red streak they, too, are martite. This ore on polished section appears to be homogeneous

⁹ The word *socavon* is the Spanish term for adit. The various adits of Cerro Mercado have lent their names to some of the individual hills.

except for small areas within the ore and for thin bands lining the cavities that have a yellow streak and are goethite.

All the martite is in part magnetic, although visible magnetite is absent. Analyses of the ore, however, show a content of ferrous iron sufficient to account for its magnetism. Whether this magnetic portion is finely dispersed throughout the martite grains or whether it represents residual masses of unaltered magnetite within the octahedrons is unknown. An analysis of the magnetic portion of a sample from the Penascos de la Industria made in the laboratory of the United States National Museum yielded the following results:

Magnetic portion of ore, Penascos de la Industria

Forest A. Gonyer, analyst

Insoluble	10.84
Fe ₂ O ₃	80.72
FeO.....	2.58
H ₂ O.....	1.36
Undetermined.....	4.50
	<hr/> 100.00

The ferrous-iron content of the above sample corresponds to 2.77 per cent of magnetite in the ore. Other analyses of the ores examined with reference to their ferrous-iron content show the amount of ferrous iron to vary from 0.5 to 5 per cent.

Goethite.—The hydrous oxide of iron goethite is widespread although not abundant in the deposits. It forms thin velvety blooms of a light chocolate-brown color on martite crystals in the vugs of the more massive ore (92155), especially at Penascos de la Industria. The lens reveals these velvety blooms to be made up of thin needle-like crystals. Rarely larger crystals of a thin barrel shape and brilliant black color and up to 1 inch in length are found in the vugs. In other places the goethite occurs as crusts, with drusy surface and made up of radiating laths (92152).

Limonite.—The amorphous hydrated oxide of iron, limonite, is only sparingly present as thin secondary films due to hydration, the result of ordinary surface weathering.

Hematite and magnetite.—These minerals, other than in the form of martite, are essentially unimportant. Martinez-Quintero¹⁰ describes specular hematite in the form of beautiful rhombohedral crystals tabular to *c* and often twinned on the base. This description fits the characters of the flattened twinned octahedrons of martite so well as to appear likely that the two occurrences are the same mineral.¹¹

¹⁰ Inst. Geol. Mexico, Bol. 44, p. 35, 1923.

¹¹ The flattened form in twin crystals is very common especially in the spinel twins of magnetite and related minerals. (Note the flattening of quartz twins as well.)

Range¹² describes several different forms of hematite, including the compact, specular, and earthy hematite. He says¹³ that, while it was at one time believed that magnetite was present in considerable quantities in the deposits, careful search has demonstrated its essential absence. He believes that a certain amount does occur at Picacho Socavon 2 but in minor amounts. An analysis of the ore from this point shows 4.88 per cent of ferrous iron equivalent to 5.24 per cent of magnetite, and this is the largest amount thus far reported from the deposit. In general appearance and in magnetic effects this ore comes nearest to magnetite of any mineral yet reported. Small octahedrons and masses that are strongly magnetic are scattered through the altered wall rock and can be properly classified as magnetite.

Apatite.—Clear, glassy apatite crystals (92153) are not uncommon in many parts of the hill, where they are called "*amarillas*" (yellows) by the miners. They may be found in small numbers at Penascos de la Industria. in greater numbers and finer crystals at Cueva de la Marmaja, at various places in Socavons Nos. 1 and 2, and on the northern slope of the hill. Their color is a clear lemon yellow. In

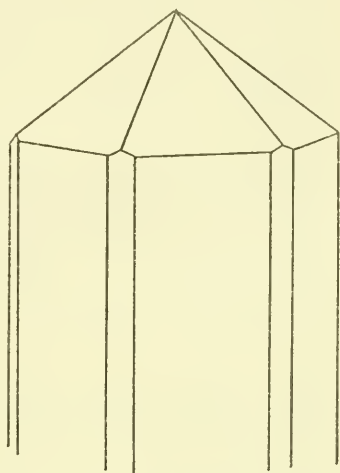


FIG. 2.—CRYSTAL HABIT OF APATITE

form they are hexagonal prism modified by narrow faces of the second-order prism and terminated by the six faces of the unit hexagonal pyramid. (Fig. 2.) The largest crystals observed by the writer are two presented by Señor Rangel to the collections of the United States National Museum and to the Holden collection of the Harvard Mineralogical Museum and which measured 4 centimeters in diameter and 5 centimeters long. Many of the crystals are sufficiently clear and flawless to be cut into semiprecious gem stones.

The apatite crystals are found in several different modes of occurrence; most commonly in small crystals in the cavities of compact martite ore at Penascos de la Industria where it is associated with martite crystals or more rarely imbedded in the massive ore. At Cueva de la Marmaja they are found in small veinlets in the soft ore and it is from here that the better grade of "*amarillas*" come. In Socavon 1, they are associated with quartz and chalcedony and are always broken and imbedded in light masses of sepiolite. In the older workings on the north slope of the hill the apatite crystals are

¹² Inst. Geol. de Mexico, vol. 16, p. 6, 1902.

¹³ Oral communication to the author.

found with augite in the cracks of the brecciated rock where it coats the pebbles of the breccia. Very often they are broken off and lie in a cement of silica.

Phenacite and topaz have been reported from Cerro Mercado by Wiedner and his reference to these minerals has been passed down to the present time. The phenacite crystals have been reported as numerous on the north side of the hill and are described as yellow in color, consisting of hexagonal prisms terminated by a six-sided pyramid. Wiedner described the crystals as being somewhat altered because they did not have the superior hardness of phenacite although they still retained their natural luster and brightness. Later Wiedner calls these crystals apatite. The topaz is described as occurring in prismatic crystals of a straw-yellow color. All these associations are common for the yellow apatites and search by a number of observers have failed to reveal any true phenacite or topaz.

A second type of apatite is frequently found in the vugs of the martite ore at Penascos de la Industria (92151). This apatite is colorless or white and is characteristically in radiated groups of small crystals. They are of a later generation than the yellow apatite for in many cases the latter are coated with goethite and this in turn supports the colorless apatite. These later crystals differ in habit from the yellow ones and occur in three forms. The commonest is long needlelike crystals with a steeply curving pyramidal zone so that they are barrel shaped. Others are long needles terminated by steep but rounded faces of a pyramid similar to the "berylloid" of beryl. A third form are short prisms terminated by the unit pyramid or by the base.

The clear yellow crystals of apatite are normal fluorapatite in their properties. They are uniaxial, optically negative with $\epsilon=1.630$, $\omega=1.633$. The acicular needles are likewise apatite although their indices of refraction are somewhat lower than those of the yellow ones. They give a weak reaction for carbon dioxide and carry only a trace of chlorine. Their indices of refraction $\epsilon=1.626$, $\omega=1.629$, are somewhat low for normal apatite, due to the small carbon dioxide content.

Dahllite.—At Penascos de la Industria there occurs sparingly in the vugs of martite small hexagonal plates or prismatic crystals, usually not more than 1 millimeter in length, consisting of the simple prism and unit pyramid (92150). These tabular crystals effervesce with hydrochloric acid and are always divided into six weakly birefracting segments which in turn are again divided into a variable number of concentric zones. Their indices of refraction are $\epsilon=1.609$, $\omega=1.626$. The sectors are biaxial and negative, with a small but variable axial angle and they show inclined extinction with the outer

hexagonal edge under crossed nicols. This extinction is very variable, the same zone extinguishing heterogeneously and varying from 8° to over 30° . The prismatic crystals are likewise zoned, the outer shell peeling off easily leaving a firm glassy center. Their indices of refraction are higher than normal apatite $\epsilon=1.648$, $\omega=1.653$. They effervesce slowly with acid and give a microchemical test for chlorine and hence may be considered as an isomorphous mixture of chlorapatite and dahllite.

The platy dahllite has been found as a very fine grained mass with a somewhat silvery luster coating martite crystals. The prismatic type occurs as isolated crystals seldom over 1 millimeter in size scattered over goethite that in turn coats the martite crystals.

Unknown phosphate.—Associated with the colorless apatite in the vugs of martite is a mineral occurring in rose red to lavender botryoidal masses with a finely drusy surface (92156). This mineral gives strong microchemical reactions for lime and phosphorus and weak reactions for iron. Its amount, however, is insufficient for a complete chemical investigation. The mineral has the following optical properties: Biaxial, optically negative with a large axial angle. Dispersion strong, ρ greater than ν . $\alpha=1.568$, $\beta=1.578$, $\gamma=1.582$. Color pale to bright rose, the tint being more intense at the center of the radiated groups. It is pleochroic in shades of rose in thick grains only.

Augite.—Augite is a common constituent of the altered wall rock about the iron ores, where it forms reticulated to radiated masses in the clayey altered latite (92147) or forms a pure augite rock (92148). The color varies from bright grass green to a dark greenish black. In some of the old workings on the north slope of the hill crystals of augite were found in abundance associated with clear yellow apatite, coating the fragment of breccia. These crystals are prismatic (92159) and the larger ones exceed 1 centimeter in length. Measurement on the two circle goniometer shows the following faces to be present c (001), m (110), g (210), f (310), a (100), b (010), and sometimes e (011). The crystals are nearly all twinned, and Figure 3 shows their general habit.

In color these crystals are dark greenish black but in thin sections or in small grains under the microscope they have a clear grass to emerald green color. Their pleochroism is weak. The optic axial angle is about 60° and the extinction angle about 40° . The indices of refraction are $\alpha=1.700$, $\beta=1.708$, $\gamma=1.727$. An analysis made in the laboratory of the United States National Museum upon selected crystals that had first been washed with hydrochloric acid to remove some slight stains of limonite gave the following results:

Analysis of augite (92159) from Cerro Mercado

Forest A. Gonyer, analyst

SiO ₂ -----	50.97	MnO -----	None.
TiO ₂ -----	.20	K ₂ O -----	0.05
FeO -----	6.96	Na ₂ O -----	1.86
Fe ₂ O ₃ -----	7.08	H ₂ O -----	.19
Al ₂ O ₃ -----	.95		
CaO -----	20.96		100.77
MgO -----	11.55		

The mineral is therefore essentially diopside with minor amounts of the hedenbergite and acmite molecules. The mineral composition, calculated from the above analysis, is:

Diopside -----	65.0
Hedenbergite -----	22.8
Acmite -----	11.0
Magnetite -----	1.2
	<hr/> 100.00

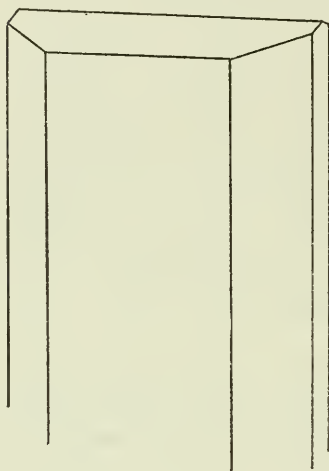


FIG. 3.—CRYSTAL HABIT OF AUGITE

determined under the petrographic microscope, yielded the following results:

Analysis of sepiolite (92158), from Cerro Mercado

W. F. Foshag, analyst

H ₂ O (—) -----	8.60	CaO -----	0.24
H ₂ O (+) -----	10.20	MgO -----	22.95
SiO ₂ -----	55.34		<hr/> 99.57
Al ₂ O ₃ -----	1.81		
Fe ²⁺ O ³ -----	.43		

Under the microscope the sepiolite is so finely fibrous that the precise optical properties can not be determined. The mean index, however, was found to be 1.52, which corresponds well with that of ordinary sepiolite.

Sepiolite is later than the martite and, since it incloses broken crystals of apatite, is later than this mineral as well. Associated with it is quartz that is obviously later than the sepiolite.

Quartz.—Quartz is not abundant and is one of the later minerals to form. It is commonly observed as nests of small crystals of the ordinary prismatic habit in the open spaces of the sepiolite or as crystal coatings in the brecciated ore, cementing broken martite and apatite, sometimes associated with barite.

In the soft ore of Cueva de Marmaja harder lenses occur in which the ore owes its superior resistance to a cement of quartz. In this ore the delicate branching forms of the martite are inclosed in a quartz matrix. Some small quartz crystals are also found in the cavities of the compact ore of Socavon No. 2.

Chalcedony.—This mineral is encountered as a constituent of the augite rock found at the contact of the latite and the ore. In other places typical chalcedony coats some of the earlier minerals, but it is not common. It forms an important constituent of the tuffs where it is secondary and impregnates the rock to a large extent. Massive cherty silica is abundant to the north of the hill where it completely replaces the rhyolite porphyry in such abundance that it is quarried and used as furnace linings.

Opal.—Some hyalite was noted as clear glassy botryoidal crusts on some of the earlier minerals, especially on the colorless apatite crystals in the vugs of the martite ore of Penascos de la Industria.

Calcite.—Carbonate of lime is sparingly present as a cement of crushed martite and apatite associated with abundant quartz at Socavon No. 2 and as a replacement of crushed porphyry at Labores de la Cueva.

Barite.—Tabular crystals of barite, white to pink in color and aggregated into platy masses were identified associated with quartz and calcite cementing broken martite and apatite at Socavon No. 2. It is of the same generation as quartz and calcite.

Unknown pseudomorphs.—There was noted in the cavities of the ore from the Penascos de la Industria associated with delicate needles of goethite, a mineral now completely altered to red hematite. These crystals do not exceed a millimeter or two in size and are tetragonal in crystal form. The forms noted are the prism and a steep pyramid, and their habit is much like that of octahedrite, but the original nature of the mineral is unknown.

Other minerals have been described from Cerro Mercado but have not been confirmed. Rangel mentions a phosphate of iron from Cueva de la Marmaja and showed the writer some such material. Similar specimens collected from this spot had the rusty appearance of the specimens shown to him but carried no determinable phosphate of iron. Chrustschoff reported, in addition to those already described, amethyst, fluorite, and garnet. Probably these three species come from some near-by point, but it is doubtful that they came from Cerro Mercado itself.

PARAGENESIS

The first definite step in the formation of the ores of Cerro Mercado was a brecciation of the country rock. This brecciation can be best seen in the old workings on the north side of Picacho Norte at the point called Labores de la Cueva and from which the specimen illustrated on Plate 4 was obtained. The groundmass is now completely altered, or nearly so, to a mixture of calcite and magnetite with minor amounts of diopside. One may also find here partially altered fragments of wall rock coated over with a thin crust of martite crystals. This brecciation may also be observed in a number of places along the western contact of the ore. The effects here are illustrated in the figure on Plate 3 illustrating the alteration of the fragments of brecciated latite to a pyroxene (diopside) rock.

Following this brecciation came the introduction of magnetite and minor amounts of calcite. Apatite and diopside began to form later in this same stage, and continued after the complete crystallization of the hematite. This was followed again by brecciation leaving much of the ore in a badly broken condition and with numerous broken apatite crystals which were cemented by later quartz, calcite, and sepiolite.

A still further stage was hydrothermal in character, its chief effects being an introduction of silica and the alteration of some of the minerals already formed. In this stage magnetite (or martite) was hydrated to goethite; colorless apatite and dahllite were formed; small amounts of quartz, calcite, and barite were introduced and in places a considerable development of sepiolite took place.

Later changes were of minor importance and only feebly developed. Chalcedony was introduced in small amounts, to be followed later by opal, and finally, as a secondary effect due to surface weathering, a small amount of limonite formed.

The various steps in the paragenesis of these ore bodies may be tabulated as follows:

- Brecciation of the country rock.

- Introduction of magnetite.

- Introduction of apatite and diopside.

- Brecciation of the ore.

- Formation of goethite.

- Formation of (1) sepiolite, (2) colorless apatite, dahllite, quartz, calcite, and barite.

- Formation of chalcedony.

- Formation of opal.

- Formation of limonite.

Concerning one of the most important steps of the sequence—the conversion of magnetite to hematite—we have as yet no data. It is the writers' opinion that this took place after the brecciation of the

ore and during the hydrothermal stage that resulted in the formation of the sepiolite, quartz, calcite, and barite. It is possible that the brecciation of the ore was due to this conversion of magnetite to hematite, since there is a small diminution of volume involved in this change. Many of the broken surfaces seem quite fresh, others are somewhat altered. Few, if any, show a development of goethite upon them.

ORES

The ores of Cerro Mercado are as already stated essentially all martite, although other minerals of iron are encountered in minor amounts. The ores as mined contain 65 to 68 per cent of iron and while they are quite high in phosphorus, they are practically wanting in sulphur and titanium. Manganese is present in essentially negligible amounts. Its exceptionally high content of iron means that there is practically no gangue mineral in the ore and indeed an inspection shows nothing more than a very small amount of silica and apatite.

The chief workings are at the southwestern corner of the hill where a cliff of iron ore rises from the valley. At this place, called Penascos de la Industria, the iron ore is hard, has numerous cavities lined with octahedrons of martite, but carries no other minerals except very minor amounts of goethite, and apatite. The goethite lines the cavities and coats the martite while the apatite is found as small white needles. The ore is dark steel gray in color and of the highest grade.

Martite ore, Penascos de la Industria

Forest A. Gonyer, analyst

SiO ₂ -----	0.32	MgO-----	0.72
TiO ₂ -----	None.	MnO-----	Trace.
Fe ₂ O ₃ -----	93.64	P ₂ O ₅ -----	None.
Al ₂ O ₃ -----	4.04	H ₂ O-----	.31
FeO-----	1.15		
CaO-----	None.		100.18

The locality on the west flank of the Picacho Socavon 4, called Cueva de la Marmaja, is also being actively worked and produces high-grade ore. Here the mineral is a friable sandy mass made up almost entirely of small black octahedrons of martite. The softer material is a black sand that can easily be picked down, while the somewhat more compact ore is spongy and friable. Occasional hard lenses owe their superior resistance to a siliceous cement. In color the ore is dark bluish to greenish black which sometimes show numer-

ous small brilliant yellow crystals of apatite, apparently contemporaneous with the martite. An analysis of this ore yielded the following results:

Iron Ore, Picacho Socavon 4

Forest A. Gonyer, analyst

SiO ₂ -----	0.52	MgO-----	0.20
TiO ₂ -----	.48	MnO-----	None.
Fe ₂ O ₃ -----	86.60	P ₂ O ₅ -----	None.
Al ₂ O ₃ -----	1.76	H ₂ O-----	.19
FeO-----	4.88		
CaO-----	2.56		100.01

Later examination of the specimen analyzed showed it to be abnormally rich in apatite and accounts for the high phosphate value. The iron content calculated to metallic iron is 64.41 per cent.

From Picacho Socavon 2, the ore is less crystalline and more compact. Here it is massive, with only a few small vugs, is dark steel gray to brilliant iron black in color and is hard and tough. Except for small druses and thin seams of quartz no other mineral was noted except that on polished surface the small vugs are seen to be lined with a thin coating of goethite and a few small patches, apparently former cavities, are now completely filled with that mineral. An analysis of this ore gave the following:

Iron Ore, Picacho Socavon 2

Forest A. Gonyer, analyst

SiO ₂ -----	9.44	MgO-----	0.20
TiO ₂ -----	None.	MnO-----	None.
Fe ₂ O ₃ -----	85.40	P ₂ O ₅ -----	None.
Al ₂ O ₃ -----	4.12	H ₂ O-----	.19
FeO-----	.58		
CaO-----	.08		100.01

Besides the ores now being mined the so-called *boleo* ore flanking the hill on several sides was of importance in the early days of smelting. This ore consists of pebbles and boulders of detrital ore, in some places loosely cemented, in others loose and gravelly. It consists largely of hematite in the form of pebbles or as loose martite crystals, often superficially converted to limonite or coated and cemented by the latter mineral. Because of its lower phosphorus content, this ore is said to be very high grade and is therefore particularly desirable.

ORE BODIES

There are four main masses of iron ore at Cerro Mercado. The one now being actively worked flanks the hill on the west, forming a prominent ridge and has a length of 800 meters and a maximum

width of 150 meters, with a thickness as near as can now be judged not exceeding 60 meters. Its outcrops form prominent clifflike exposures 30 to 40 meters high. Viewed from the south this ore body appears to be a tabular mass with a general dip to the west. Its contact with the country rock on the east is sharp, due to the well defined fault that borders it. On the west the ore body passes abruptly into numerous anastomosing veins so that its border has the general appearance of a breccia with a cement of ore. This ore body is probably made up of two segments; the main one including Picachos Socavon 1, 2, and 4; and a down faulted segment that forms the ore of the Penascos de la Industria.

Socavon 1 which penetrates this ore body begins at its contact with the latite at an elevation of 1,950 meters above sea level and passes through 150 meters of solid iron ore and then enters a wide zone of highly altered latite for the rest of its length (225 meters). Another adit, Socavon 2 begins at the contact of the ore at an elevation 1,975 and is driven east and north for a considerable distance and is entirely in solid ore.

The other ore bodies have not been explored but their size can easily be judged from their prominent outcrops. Immediately east of the ore body now being worked is a broad tilted tabular mass of ore that caps Cordon Rangel. This body, roughly circular in outline has a diameter of about 250 meters. Socavon 1 passes directly under this ore capping but after leaving the western ore body is in altered latite for the rest of its length. It can reasonably be concluded that this ore body is tabular in form and probably does not exceed 40 meters in thickness.

Further east and capping the central portion of the hill is the ore body of Picachos Sur and Norte. Its southern outcrop is bold; to the north it merges into the smoother slopes. Some old workings on the north side of this body show that the rock has been considerably brecciated and later cemented by the calcite, magnetite, and augite. The southern part, however, is of firm iron ore of high grade. This body is probably tabular in form with a slight dip to the north.

The easternmost ore body is that of Picacho de la Cruz and Relices Prieto where the iron ore forms bold castellated outcrops of pure mineral. It is apparently faulted into several segments but lack of any work on it precludes determination of its true form.

Several minor bodies occur at the northern foot of Picacho Socavon 2 of which the most interesting is that of Socavon de la Cueva. This ore body has been opened by several adits and shows fine flaky hematite as bedlike schliers in a soft tuff. These schliers are continuous for considerable distances.

Farther north, at the small knoll of iron ore called Picacho Rangel the ore is similar to the ore of the main deposits but the country rock is rhyolite instead of latite.

SIMILAR DEPOSITS

In some respects the iron ores of Cerro Mercado are unique in that they are deposits of the first importance connected with extensive volcanic rocks of Tertiary age. There are, however, a few minor iron-ore occurrences of this type, and some of the features of the famous Kiirunavaara deposits of Sweden as described by Per Geijer, Stutzer, and others are similar. Minor developments of hematite in some of the rhyolites of Tertiary age, especially when associated with tin, are common in Durango and other parts of Mexico but are of only mineralogical interest and are perhaps of somewhat different origin. In this case the iron mineral is always specular hematite and never martite.

The iron-ore deposits of Barth, Nev., described by J. Claude Jones¹⁴ are remarkably similar to the Cerro Mercado. Like them the ores are found in Tertiary eruptive rocks of andesitic character. The iron mineral is hematite. Apatite is present and there is a development of biotite along the walls. The boundary of the ore and the andesite wall is sharp; that is, without gradation of ore to wall rock, but the ore extends into the footwall as anastomosing veins, cementing the included fragments of the andesite into a breccialike mass. Where the veins are particularly abundant the fragments are changed in color to a deep green and contain much biotite in an indefinite matrix. Clusters of apatite radiate from the angles of the andesite fragments and phlogopite is particularly abundant in their vicinity. The ore is massive and compact hematite, through which are disseminated euhedral crystals of apatite. It is somewhat magnetic but little or no magnetite can be detected.

This is an almost exact description of Cerro Mercado ores with the augite of Cerro Mercado in place of the biotite of Barth. Such close similarity argues for a close relationship.

The martite deposits of Twin Peaks, Millard County, Utah, described by Horace Patton¹⁵ are also closely related to those of Cerro Mercado. The country rock is a light colored rhyolite with abundant phenocrysts of quartz and some biotite and hornblende. It is a very massive rock but only exceptionally is it fresh. It is cut in different directions by sharply defined veins of martite which vary in width from 1 inch to 7 or 8 feet. Associated with this martite are two other minerals—apatite and augite. The apatite crystals, originally white and quite transparent, are small, rarely over an inch or more. The pyroxene occurs in slender crystals of a black color. Specimens of these augite crystals now in the National Museum are exactly

¹⁴ Economic geology, vol. 8 pp. 247-263, 1913.

¹⁵ Martite Crystals from Twin Peaks, Millard County, Utah. Colorado School of Mines, Quart., vol. 2, pp. 7-13, 1907.

similar in habit and twinning to those of Cerro Mercado. The martite veins are sometimes open fissures with the two walls lined with crystals. In other cases the veins are brecciated, the fissure partially filled with rhyolite fragments now coated with martite crystals. In the occurrence of the martite with rhyolitic rocks, the presence of apatite and augite, and in the brecciated nature of some of the veins with the breccia fragments coated with martite crystals, this deposit is similar to those of Cerro Mercado.

The resemblance between Cerro Mercado and Kiirunavaara, Finland, has been suggested by Per Geijer¹⁶ but since definite data at that time were lacking no real conclusions could be drawn. Like Cerro Mercado the ore deposits of Kiirunavaara are sheetlike bodies in acid volcanic rocks, here largely syenites and quartz porphyries; whether extrusive or intrusive is still a mooted question. Lundbohm, Backstrom, and Geijer regard them as flows, while Stutzer and Daly believe them to be intrusive rocks. The ore mineral is magnetite, and only to a small extent is it mixed with hematite. In the exposures on "Professorn," however, hematite is abundant and the ore is unusually porous and is believed by both Stutzer and Geijer to be secondary.

Minerals other than magnetite are quite rare in the entire field; the most abundant of these extraneous minerals being apatite. The amounts vary from masses of pure magnetite to others of pure apatite but the main mass of ore does not average over 1 to 2 per cent. Pyroxene and hornblende are present in much smaller amounts. Sulphur seldom exceeds 0.05, titanium varies between 0.04 and 0.80 but may reach 1.36 in Luossavaara. Other minerals noted are calcite, quartz, biotite, tourmaline, asbestos, and siderite. The tenor of the ore is very high, varying from 65 to 70 per cent.

As a rule the contacts between the ore and the country rock are sharp and often without noticeable alteration of the inclosing rock. Often, however, the country is penetrated for a distance of several meters by a complex system of anastomosing veinlets of ore to such an extent that the rock appears brecciated. About the borders of the ore in many places the wall rock is altered to a *skarn* of amphibole or to a diopsidic pyroxene. The hornblende is, without doubt, the result of the uralitization of preexisting pyroxene.¹⁷

The analogies between the ore deposits of the Cerro Mercado and Kiiruna district may be listed as follows:

1. The association of the ore bodies with acid volcanic rock.
2. The high iron content and purity of the ores.
3. The abundance of apatite in the ores.

¹⁶ Igneous Rocks and Iron Ores of Kiirunavaara, Luossavaara, and Tuolluvaara. Per Geijer. Stockholm, 1910.

¹⁷ Per Geijer. Inst. Geol. Mex., Bol. 44, 1923, p. 246.

4. The anastomosing veinlets that cut and brecciate the country rock.

5. The alteration of the wall rock to a pyroxenic skarn.

6. The tabular form of the ore bodies.

The resemblances are much greater in those portions of the Kiiruna district where the original magnetite has been secondarily changed to hematite corresponding to the martite ore bodies of Cerro Mercado. One may reasonably conclude that the hematite ores of Cerro Mercado are formed by the secondary oxidation of magnetite, such as those Geijer describes at "Professorn," the oxidation having been carried to the almost complete alteration of the magnetite.

ORIGIN

A number of writers have expressed views on the origin of the great ore bodies of Cerro Mercado but only two are the result of a sufficiently detailed examination to merit serious attention. These are the works of Manuel Rangel¹⁸ and Leopoldo Salazar-Salinas and his coworkers.¹⁹ We may, however, mention very briefly some of the earlier views.

Frederico Weidner²⁰ one of the first to visit the locality and to report upon its iron resources held that the ores were the result of volcanic activity:

One finds rounded ore masses from Cerro Mercado of the shape and figure of projectiles scattered on all the immediate terrain, not only on the lower portions, as is natural, but also on some of the higher hillocks which seems explainable only that the volcanic force of the hill to have flung and transported them to these points.

In the porphyry hills which encircle Cerro Mercado one finds the most apparent vestiges of volcanic action of the mass of Cerro Mercado, because there one finds that the porphyries are altered in color, luster, and texture as if they were smelted and fragments of the porphyry rock are found inclosed in the crystallized magnetic iron; on the south side of the Cerro the porphyry incloses particles of micaceous iron, which could have penetrated it only through sublimation; to the southeast side the porphyries are wrapped in oxide of iron to the extent of being partially converted to *almagre*; in the central part of Cerro Mercado and its folds lies pieces and banks of destroyed porphyry evidently lifted by the iron; all of which proves that the Cerro Mercado is of an origin later than the porphyry in which it rests, that the porphyry previously occupied the place now of metal. This last, impelled by volcanic force has burst the floor of the valley, breaking through the porphyry, dislocating, lifting, and breaking some of it in its path and involving in its mass many fragments of the same rock which it has just destroyed.

¹⁸ Los criaderos de fierro del Cerro de Mercado, Durango. Bol. 16. Inst. Geol. Mexico, 1902.

¹⁹ El Cerro de Mercado, Durango. Bol. 44, Inst. Geol. Mex.

²⁰ Anales del Ministerio de Fomento. Mexico. Vol. 3, pp. 169-170, 1877.

While Chrustschoff²¹ does not accept this idea entirely, still he believes that the deposits were due to some form of eruption, probably a fluid aqueous mass, that rose through channels to spread out about their openings.

Birkenbine²² in his description of the occurrence has little to say regarding its genesis. His ideas are embodied in the following citation:

I incline to the belief that the Cerro de Mercado is formed of one or more immense veins or lenses of specular iron ore, standing nearly vertical, the fragments of which have, by the action of the elements for ages been thrown down to form the slopes of the mountain as a talus.

Manuel Rangel²³ describes the ore body as follows:

The mineral part presents the form of a very strong dike, ramifying in the western part, with two small branches to the north and includes admixture of rhyolite. Erosion operating primarily on the inclosing rock, has disintegrated it into blocks of diverse shapes that have been deposited on the talus slopes of the hill; the part of the mineral so uncovered has suffered on its part, the slow and continued action of the weather and has been disintegrated into fragments of variable size which have formed as talus deposit, an apron of mineral which gives to Cerro Mercado the appearance of a mountain made up only of ferruginous minerals. The illusion disappears through a close examination of the structure of the mountain. In effect, in the base one sees enormous banks of rhyolite; higher, the fragments of rhyolite, covered on some of their faces with crystallized minerals of iron in small octahedrons, are mixed with pieces of mineral, whose proportion increases with height until it constitutes the entire deposit forming the crest of the hill.

Since Señor Rangel wrote this he has continued exploratory work on the deposits and has demonstrated that the ores do not continue downward but that the form is that of dipping tabular bodies; hence the inference that the ore bodies are of the nature of a dike-like intrusion, I believe, Señor Rangel is now willing to modify.

In the report of Cerro Mercado by Leopoldo Salazar-Salinas and his coworkers,²⁴ there are two somewhat distinct conceptions advanced. According to the interpretation of A. R. Martinez-Quintero²⁵ the pyroxenitic rocks that surrounded the iron-ore bodies are intrusive pyroxenites, and he refers the source of the iron to a batholith of which this rock is a basic border phase.

According to Martinez-Quintero:

The intrusive is probably a batholith with a basic border phase forming the contact; the visible portion of the intrusion being a pyroxenite whose principal constituent is the hedenbergite-diopside, which in narrow crystals is encountered, among other places, in the differentiated dikes of the Cerro de Fray Diego.

²¹ Einiges ueber den Cerro del Mercado bei Durango in Mexico, Würzburg, 1878, Abs. in Zeit. Krys., vol. 3, pp. 632-634, 1879.

²² Amer. Inst. Min. Engrs. Trans., vol. 13, pp. 189-209, 1885.

²³ Criadero de fierro del Cerro de Mercado. Inst. Geol. Mex. Bol. 16. pp. 3-14, 1902.

²⁴ El Cerro de Mercado. Inst. Geol. Mex., Bol. 44, 1923.

²⁵ Salazar-Salinas. Inst. Geol. Mex., Bol. 44, 1923, p. 41.

Forming an ultrabasic phase at the contact, a part of the iron must have accompanied it and upon solidification the globules of oxide of iron which were first suspended became imprisoned in the pyroxenite, as one sees in the samples that have been studied.

Later, when the magma had solidified, the gaseous emanations of water vapor, P_2O_5 , CO_2 , Cl , and some others, as well as the magnetic solutions, contributed to the enrichment of the mass of iron already formed, transporting iron from the lower to the higher portions and being deposited in the same oxides through simple crystallization or through substitution of the adjacent igneous rocks. At the Cueva de la Marmaja one encounters vestiges of the rock which was not completely substituted but altered and which appears to belong to the porphyritic rock in which the K_2O predominates over Na_2O .

Salazar-Salinas's²⁶ own views are expressed in the following citation:

There was formed, at a profound depth, a magmatic chamber of basic nature, which moved through a fold of sedimentary formation, this same fold accentuating its effect upon the pressure was able to bring about the fusion of the deeper siliceous sediments, giving a new magmatic chamber which, through the lesser density of its constituents penetrated the basic chamber and terminating in superposition, staying in part intermixed, one with the other; or admitting the existence of the acid effusive rock, this was penetrated by the magmatic products leaving traces of this passage in the phenomena of metamorphism and in the mixture of the elements.

To properly explain the origin of the ores of Cerro Mercado account must be taken of the following features:

1. The occurrence of iron ore in Tertiary acid volcanic rocks, including rhyolites, latites, and tuffs.
2. The occurrence of iron ore in broad tabular bodies.
3. The occurrence of iron ore as martite, the pseudomorphous form of hematite.
4. The association of the minor mineral constituents, especially the apatite, with the ore.
5. The alteration of the wall rock to pyroxene, chert, and montmorillonite.
6. The numerous anastomosing veinlets of ore in the wall rock.

The objections to the ores of Cerro Mercado having originated as a flow of magnetite are quite evident. The ore bodies are without doubt a later introduction and not contemporaneous with the enclosing rocks. Alteration of the wall rock has taken place to a perceptible degree and the ore bodies are not concordant with the position of the flows of volcanic rock but are inclosed in all the types of rock exposed.

The explanation that the ore deposits are dikes seems at first a logical one but continued exploration under Señor Rangel's direction has demonstrated that they are not in the form of dikes, but that their mass has no great downward extension and that they are more in the nature of flat lying tabular bodies of ore. With this

²⁶Salazar-Salinas. Inst. Geol. Mex., Bol. 44, 1923, p. 44.

new evidence in hand one can readily determine that such ore bodies as that of the west side of the hill of Cordon Rangel and of Picachos Sur and Norte are also not dike-like as they appear to be, but portions of a larger tabular form broken up into segments by faulting. One may point also to the occurrence of ore as schlieren in the tuffs of the Socavon de la Cueva as further evidence contrary to the formation of the ore in dikes. Soler²⁷ has attempted to explain this tabular form of the ore as a faulted body of segregated ore; that is, the magnetite is a magmatic segregation in tabular form that has been faulted into segments. The difficulties of accepting such a mode of origin are, of course, obvious, chief of which is the occurrence of ore in the tuffs and it does not explain the occurrence of pure hematite in siliceous rocks such as rhyolite.

There are but three genetic processes that merit serious consideration: Firstly, an origin through intrusion of a magnetite magma, invading the rhyolite, latite, and tuff; secondly, a replacement of these rocks by iron-bearing solutions; and thirdly, fumarolic activity. All these ideas are open to criticism and objection but it is believed that the final choice must lie between them.

The association of magnetite and apatite immediately suggests that the ores are the result of magmatic segregation of some sort. That they can not have segregated from such rocks as rhyolites and tuffs in which they are now found is quite evident. They must have had their origin in some deeper source. The numerous anastomosing veinlets are also suggestive of intrusion, as is also the further fact that, while the wall rocks are altered, the alteration is not as great as one would ordinarily expect from aqueous solutions, but might be accounted for by the smaller amounts of solution accompanying a dike-like intrusion. So far the evidence points satisfactorily to intrusion but when we come to consider the manner in which a magma of such composition may form we are confronted with difficulties. If our present ideas on magmatic differentiation are correct a magnetite-apatite body could form by the separation and segregation of the crystals of these minerals into definite bodies. But the difficulty arises in that this body of magnetite and apatite must be brought again to a state of fusion in order to traverse and inject rocks as readily fusible as itself without contamination.

The suggestion that the iron ores of Cerro Mercado may be the result of fumarolic action rests upon the observations of E. G. Ziess²⁸ of the formation of magnetite at the Katmai region of Alaska. About some of the hotter fumaroles there formed great

²⁷ Report to the Cia. Fundidora de Hierro y Acero de Monterrey, S. A., pp. 30-35, 1925.

²⁸ The Fumarolic Incrustations in the Valley of Ten Thousand Smokes. Nat. Geol. Soc. Tech. Papers. Katmai Series vol. 1, No. 3.

quantities of magnetite, measurable by the thousands of pounds. The iron chloride vapors were continually swept out by the continuous passage of steam, reacting at the mouth of the fumarole with this steam to form magnetite and hydrochloric acid. As the fumarole decreased in temperature the magnetite thus formed was reattacked by the acid and the deposit of iron ore eventually disappeared. While there seems little evidence to support such a hypothesis for Cerro Mercado, yet the occurrence of the iron minerals there in tuffs, as at Katmai, and the physical resemblance of the Katmai magnetite with much of the martite ore of Mercado is striking and such a hypothesis may well be borne in mind.

An origin by the replacement of the inclosing rocks by iron bearing solutions is suggested by a number of features of the iron deposits of Cerro Mercado and is the hypothesis most favored by the writer. The impression that one first receives upon examining the ore bodies is that they are deposited by replacement but close consideration of the matter shows that all points are not entirely clear. This, however, resolves itself down largely to lack of definite knowledge concerning the chemical and physical behavior of iron bearing solutions.

The direct replacement of the brecciated country rock by iron ore has not been observed by the writer but the replacement of the fragments by pyroxene is common and the close relationship of the pyroxene to the iron ores makes it probable that the ore minerals are a result of this same process. There has been observed in specimens from the locality called Labores de la Cueva a replacement of the breccia fragments by calcite which is in turn replaced by magnetite. Further the *schlierenlike* masses of ore in the tuffs at Socavon de la Cueva can only be explained as a replacement of the tuffs by ore and not by any means of injection. The puzzling feature of this occurrence, however, is that in a mass as susceptible to chemical change as a tuff, there is no appreciable effect accompanying the introduction of the iron ores.

The alteration of the wall rock to pyroxene must certainly have been brought about by aqueous solutions but whether these solutions were the iron-bearing solutions or solutions given off by a magnetite magma there is no way of determining. The amount is less than one would expect if a large volume of solution had passed, yet a large amount of porphyry has been completely altered to montmorillonite although not pyroxenized. What the relation to the extensive silicification of the rhyolites at the north side of the hill has to the ore-bearing processes is still to be determined.

The nature of the solutions that may have carried the iron and replaced the wall rock is a matter of speculation and will not be dis-

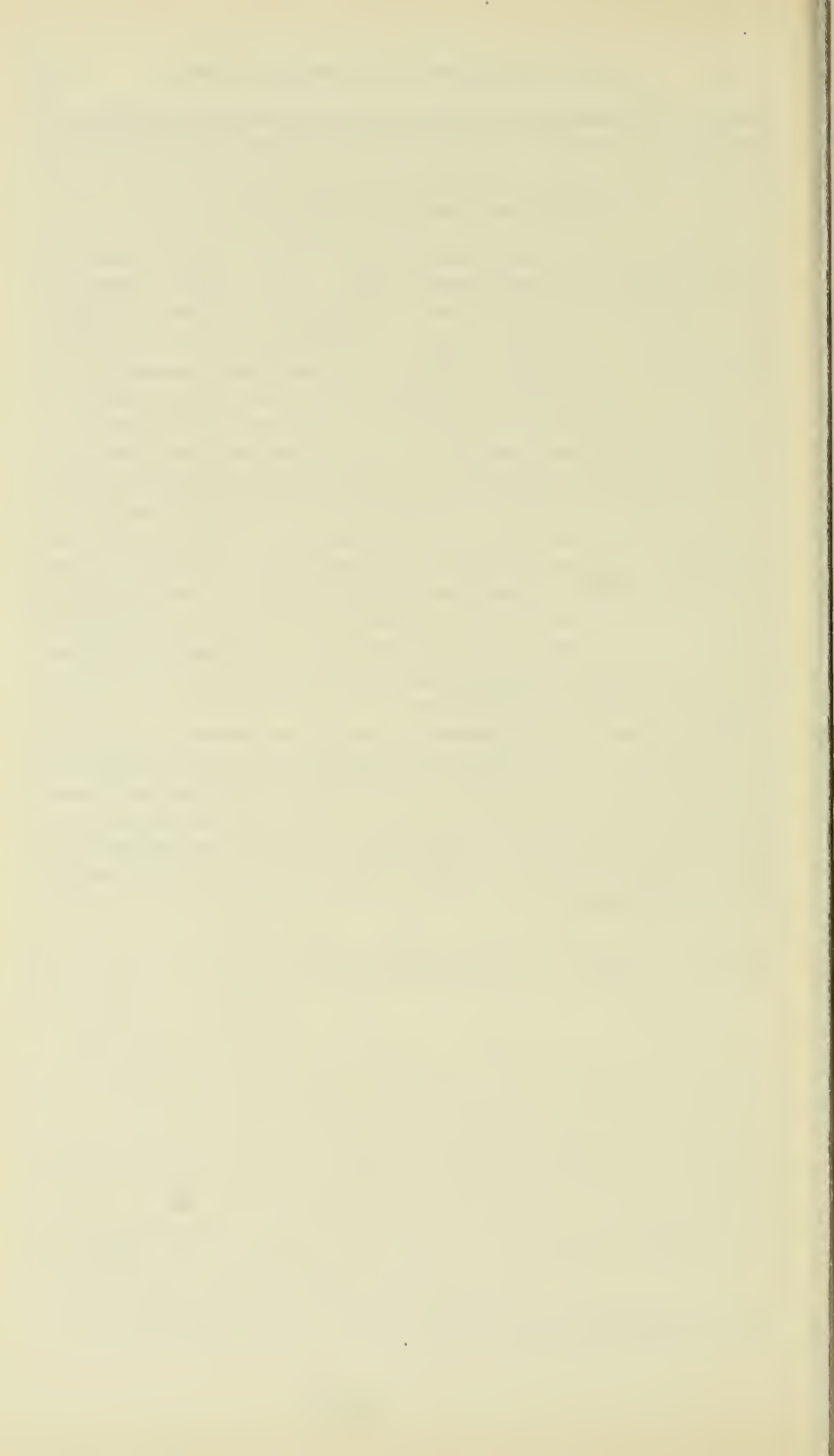
cussed. Our knowledge of such solutions is still too incomplete to draw any reasonable deductions from the data yielded by this occurrence.

MINING METHODS AND PRODUCTION

The occurrence of the iron ore as cliffs of hard ore or as banks of soft ore make mining both easy and cheap. (Pl. 2, left.) The hard ores of Penascos de la Industria are blasted down upon the quarry floor where the boulders of ore are broken up either by sledge hammers or by further blasting, the broken ore transported by wheelbarrows and loaded directly onto the cars. The soft ore of Cueva de la Marmaja needs no blasting, but is readily picked down upon the quarry floor, loaded into barrows, dumped into a bin from which it is drawn into cars, and trammed to the loading bins. The grade of the ore is high, averaging from 65 to 67 per cent; it is practically free of manganese, titanium, and sulphur, but carries some phosphorus. The cost of mining and loading is 64 centavos a ton. The total production of ore from this deposit in 1926 was 81,000 tons, but this amount can easily be increased several fold should it become desirable. According to the estimates of the Compañía Fundidora de Fierro y Acero de Monterrey, the ore reserved of Cerro Mercado was approximately 100,000,000 tons.

Much of the early production of the Cerro Mercado came from the detrital or *boleo* ore that flanks the hill on the east, south, and western sides. (Pl. 2, right.) This ore was high grade and comparatively free of phosphorus, but the richest areas have been extensively worked out and the reserves of this type of ore are small. A large amount of this ore was mined and used as flux at the smelters of northern Mexico.

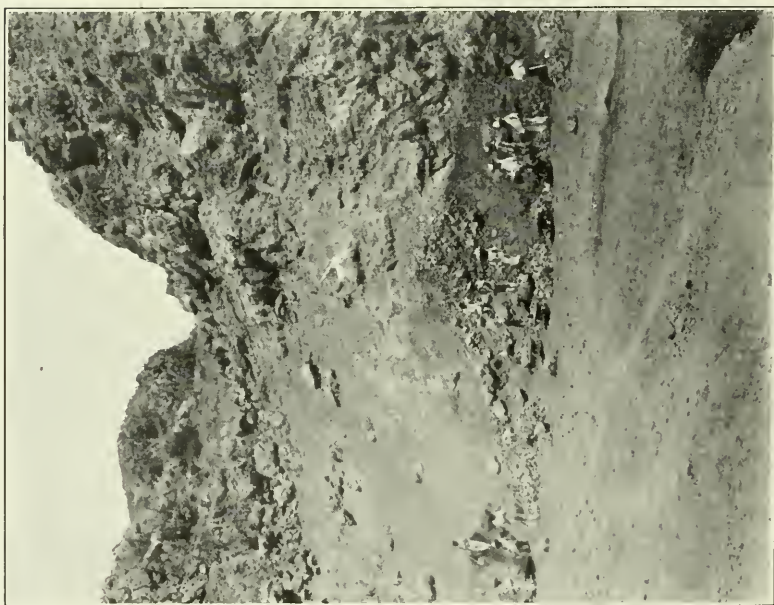
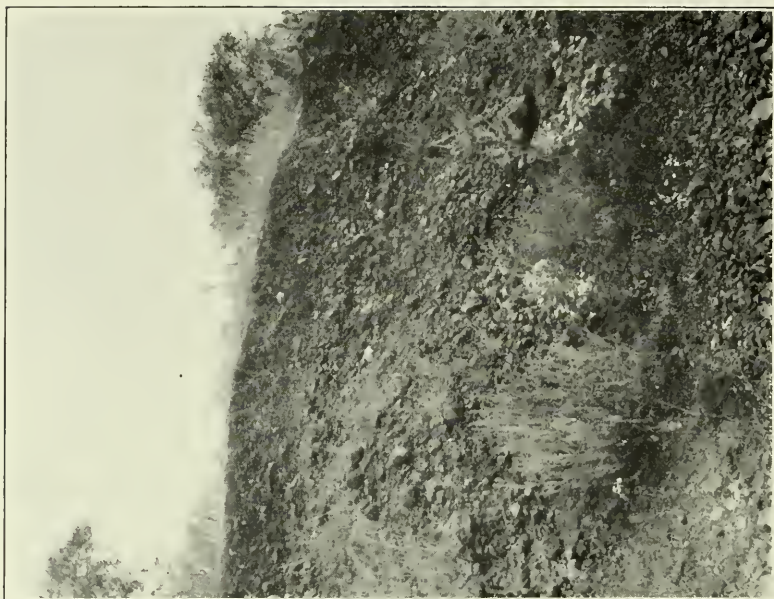






CERRO MERCADO FROM THE SOUTH. THE BOLD OUTCROPS ARE IRON ORE

FOR EXPLANATION OF PLATE SEE PAGE 2



VIEWS OF CERRO MERCADO

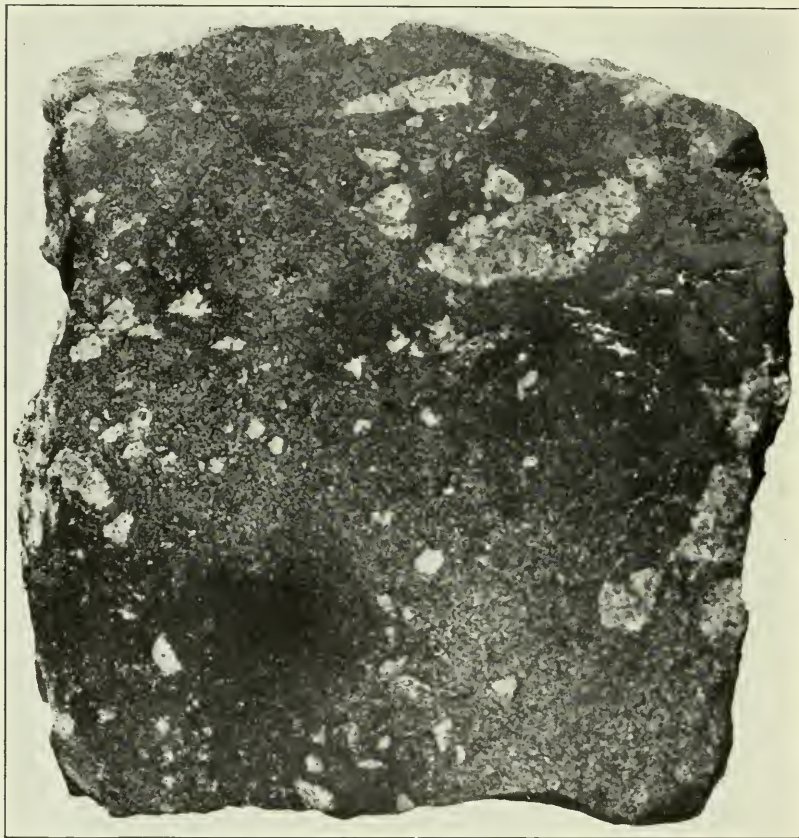
Left: Quarry in iron ore (Penascos de la Industria). Right: Cut in "boleo" ore (east slope)

FOR EXPLANATION OF PLATE SEE PAGE 27



BRECCIA PARTIALLY REPLACED BY DIOPSIDE

FOR EXPLANATION OF PLATE SEE PAGE 8



BRECCIA PARTIALLY REPLACED BY CALCITE AND MAGNETITE

FOR EXPLANATION OF PLATE SEE PAGE 8

NOTES AND NEW SPECIES OF AMERICAN MOTHS OF THE GENUS SCOPARIA HAWORTH

By HARRISON G. DYAR

Custodian of Lepidoptera, United States National Museum

The genus *Scoparia* has been generally placed in a separate subfamily of the Pyralidae, the Scopariinae, following the classification of Sir George F. Hampson. More recently Edward Meyrick has included the genus in the large subfamily Pyraustinae. The species are small gray moths of obscure appearance, some of them being very variable within specific limits. The life histories of none of the American species have been worked out. The allied European forms feed on lichens or moss in the larval state. The following new species have accumulated in the collection of the United States National Museum, largely from the collecting of Dr. William Schaus and presented by him. Notes on the synonymy and distribution of some of the older species have been added.

SCOPARIA COMMORTALIS Dyar

Scoparia commortalis DYAR, Ins. Ins. Mens., vol. 9, p. 67, 1921.

Doubtfully distinct from *rectilinea* Zeller and occurring in the same region, the northern Pacific coast. It is browner than *rectilinea*, the markings less distinct, and in the types the outer line is distinctly flexuous. In subsequent specimens, however, the line is about as straight as in *rectilinea*.

SCOPARIA DENIGATA, new species

Similar to *rigidalis* Barnes and McDunnough, but lighter gray-brown, the inner oblique and outer straight line and the discal patch more relieved. Expanse, 14–18 mm.

Type.—Male, Cat. No. 41335, U.S.N.M., Huachuca Mountains, Ariz. Paratypes, two males and one female, respectively, Arizona. August (O. C. Poling), San Diego, Calif., March 26, 1915 (H. G. Dyar); White Mountains, Ariz., altitude 7,200 feet, August, 1925 (O. C. Poling, gift of S. E. Cassino).

SCOPARIA NOMINATALIS Hulst

Scoparia nominatalis HULST, Trans. Amer. Ent. Soc., vol. 13, p. 148, 1886.

Scoparia spaldingalis BARNES and McDUNNOUGH, Cont. Nat. Hist. Lep. N. A., vol. 1, pt. 5, p. 34, 1912, pl. 3, figs. 1 and 4.

In the "Check List," 1917, Barnes and McDunnough refer *nominatalis* to the synonymy of *lugubralis* Walker, recognizing *spaldingalis* for the present form. This seems to be a mistake, because though Hulst's description is not of certain distinction between the obscure species of *Scoparia*, his locality is so. He describes from Vancouver Island, where the present species is frequent, whereas *lugubralis* was from Hudson Bay, and a colored figure of the type before me shows it to belong to the *basalis* group, as hereinafter mentioned.

The present species occurs in the Pacific coast forested region. Rocky Mountains in British Columbia, Utah, Colorado, Arizona, and as far south as Orizaba, Mexico, and Volcan Santa Maria, Guatemala (Schaus and Barnes), and the White Mountains of New Hampshire. It is very variable in the markings.

SCOPARIA ALBERTALIS, new species

Possibly one of the protean forms of *nominatalis*, but seems worthy of separation. Size and color of *nominatalis*, but the outer line appears black, not white, and is strongly excurved centrally. The inner line has dark shading, the discal dot diffused, terminal black markings slight. Expense, 18 mm.

Type.—Male, Cat. No. 41336, U.S.N.M.; Banff, Alberta, July 17, 1925 (O. Bryant). Paratype, male, Lake Minnewanka, Alberta, July 22, 1918 (H. G. Dyar). A specimen from Field, British Columbia, July 1, 1927 (T. Ulke), comes very near, but on account of the angled, not excurved outer line, I have let this stand under *nominatalis*.

SCOPARIA DELPHUSA Druce

Scoparia delphusa DRUCE, Biol. Cent.-Amer., Lep. Het., vol. 2, p. 279, 1896.

Scoparia smithi DRUCE, Biol. Cent.-Amer., Lep. Het., vol. 2, p. 279, 1896.

Scoparia sabura DRUCE, Biol. Cent.-Amer., Lep. Het., vol. 2, p. 279, 1896.

Scoparia flexuosa DYAR, Proc. U. S. Nat. Mus., vol. 54, p. 370, 1918.

The above names obviously refer to different forms of this variable species. The species occurs in Mexico, Arizona, and Colorado in the mountains.

SCOPARIA TRICOLORALIS Dyar

Scoparia tricoloralis DYAR, Ent. News, vol. 15, p. 72, 1904.

Scoparia rufitinctalis HAMPSON, Ann. Mag. Nat. Hist., ser. 7, vol. 19, p. 21, 1907.

Forested regions of British Columbia, Washington, and mountains of California. Hampson speaks of the lines as "rufous;" but though they are sometimes stained with reddish from the spreading of the reddish discal shade, the lines themselves are blackish.

SCOPARIA ECHO, new species

Ground light gray, blotched with olive-gray; lines whitish, narrow, the inner curved, the outer moderately centrally excurved; blackish blotches for claviform and orbicular, the reniform constricted, often T-shaped; subterminal shade whitish, waved, sometimes touching the excurve of outer line, preceded by heavy olivaceous shading and followed by blackish submacular terminal band. Hind wings sordid whitish. In the female, the fore wing is more heavily shaded with olivaceous blackish.

Type.—Male, Cat. No. 41342, U.S.N.M.; Victoria, British Columbia, August 21, 1920 (E. H. Blackmore). Paratypes, three males and four females, as follows: Victoria, B. C., August 21, 1921 (W. R. Carter); Victoria, B. C., August 6, 1919 (W. Downes); Fitzgerald, B. C., August 22, 1921 (W. R. Carter); Victoria, B. C., September 3, 1921 (W. R. Carter); Victoria, B. C., August 17, 1909 (A. J. Croker); Goldstream, B. C., August 12, 1920 (E. H. Blackmore); Wellington, B. C., August 20, 1903 (T. Bryant).

The specimens were originally classified under *fernaldalis*, which was thus thought to reach the Pacific coast. This form, however, has been rightly considered as a race of *basalis* by Barnes and McDunnough, and is quite distinct from *echo*.

SCOPARIA LEUCOPHTHALMA, new species

Allied to *echo*; smaller, the dark shadings more olivaceous and denser, not gray, the lines narrowed and contrasting whitish; claviform scarcely indicated; orbicular a dash; reniform Y-shaped with a little distinct white speck on its lower side. Expanse, 14 mm.

Type.—Male, Cat. No. 41343, U.S.N.M.; Victoria, British Columbia, July 13, 1922 (W. R. Carter). Paratypes five males and one female from the same locality and collector with dates as follows: July 8, 1921; July 7, 8, and 13, 1922; June 24 and 29, 1923.

SCOPARIA BASALIS Walker

Scoparia basalis WALKER, Cat. Lep. Het. Brit. Mus., vol. 34, p. 1497, 1865.

Scoparia biplagiatis WALKER, Cat. Lep. Het. Brit. Mus., vol. 34, p. 1499, 1865.

Scoparia libella GROTE, Bull. U. S. Geol. Surv., vol. 4, p. 675, 1878.

Scoparia fernaldalis DYAR, Ent. News, vol. 15, p. 72, 1904.

Scoparia obispalis DYAR, Journ. N. Y. Ent. Soc., vol. 14, p. 106, 1906.

Scoparia palloralis DYAR, Journ. N. Y. Ent. Soc., vol. 14, p. 106, 1906.

Scoparia bronzalis BARNES and BENJAMIN, Cont. Nat. Hist. Lep. N. A., vol. 5, p. 48, 1922.

Scoparia cervicalis McDUNNOUGH, Can. Ent., vol. 59, p. 267, 1927.

This is the common species of the northern Atlantic States, running south along the Blue Ridge Mountains to North Carolina. It also runs west to British Columbia, *fernaldalis* being described from

Kaslo, B. C., the race slightly larger than eastern *basalis* and darker shaded. The form *cervalis* McDunnough from Lillooet, B. C., is somewhat browner than *fernaldalis*, which inclines to gray. The species runs to the south along the Pacific coast, *obispalis* being described from San Luis Obispo, Calif., and *bronzalis* from San Bernardino. The distribution also follows the Rocky Mountains, *palloralis* being described from Colorado, New Mexico, and Arizona.

SCOPARIA PACIFICALIS Dyar

Scoparia pacificalis DYAR, Ins. Ins. Mens., vol. 9, p. 66, 1921.

Scoparia alaskalis BARNES and BENJAMIN, Cont. Nat. Hist. Lep. N. A., vol. 5, p. 49, 1922.

I have not seen specimens of *alaskalis* and the form has not been figured, but from the description it must be close to or be the same as *pacificalis*. It was described from Ketchikan, Alaska.

SCOPARIA LUGUBRALIS Walker

Scoparia lugubralis WALKER, Cat. Lep. Het. Brit. Mus., vol. 34, p. 1498, 1865.

Scoparia truncatalis McDUNNOUGH, Can. Ent., vol. 54, p. 36, 1922.

Very similar to *basalis*, but stouter and broader winged. I have not seen authentic specimens of *truncatalis*, but judge it to be the same. Specimens are before me from Trenton, Ontario, Canada, June 15, 1901 (Evans), Rochester, Minn. (C. N. Ainslie), and Nulato, Alaska, July 23, 1916 (B. P. Clark, donor).

SCOPARIA PHYCITINALIS, new species

Of the size and general color of *rectilinea* Zeller, narrower winged, the outer line flexuous and sharply indented subcostally. Gray, irrorate with black; lines whitish, the inner curved, followed by broad black shading in which the linear claviform and orbicular inhere; reniform quadrate, black and clouded; outer line preceded by black and followed by a broad black area, which has a tint of brown, itself white, sharply indented on discal fold and slightly black-dotted within; subterminal area lighter, indefinite, followed by a row of terminal dots. Hind wing pale fuscous. Expanse, 18 mm.

Type.—Male, Cat. No. 41344, U.S.N.M.; Bilby, Alberta, June 30, 1924 (O. Bryant). Paratypes, eight males and three females, ten of them from the same locality and collector, with dates June 3, 10, and 19, and July 1, 1924, and also: Kannanaskis, Alberta, June 23, 1925 (O. Bryant), and Moraine Lake, Alberta, July 11, 1925 (O. Bryant).

Other North American species not otherwise mentioned here are *centuriella* Denis and Schiffermiller (*ninguidalis* Hulst is the nor-

mal female; the type is before me from the Fernald collection), *torniplagalis* Dyar, *alialis* Barnes and McDunnough, *penumbralis* Dyar, *pallidalis* Dyar, *strigalis* Dyar, *schwarzalis* Dyar, and *normalis* Dyar.

SCOPARIA TERSELLA Zeller

Scoparia tersella ZELLER, Stett. Ent. Zeit., vol. 33, p. 476, 1872.

Described from Colombia and not at present before me. The inner pale line of fore wing is strongly oblique as in the following species. The expanse, according to Zeller's figure, is about 18 mm.

SCOPARIA PUSILLA Dyar

Scoparia pusilla DYAR, Proc. U. S. Nat. Mus., vol. 47, p. 320, 1914.

A small narrow-winged species of the pattern of *tersella*. Common on the Atlantic side of Panama, but not elsewhere reported.

SCOPARIA SUBTERSA, new species

In general as in *pusilla* Dyar, but larger. Fore wing yellowish gray, more or less overlaid with brown irrorations and blotches; lines pale, the inner strongly oblique from basal fourth of costa to middle of inner margin, which it reaches remote from the termination of the outer line; outer line flexuous, inbent subcostally; claviform and orbicular represented by black streaks, reniform blotched; a dark patch on costa above it and one within outer line; a pale subterminal line, a little flexed, followed by dotted dark shading. Hind wing white, slightly stained. Expanse, 14 mm.

Type.—Male, Cat. No. 41347, U.S.N.M.; Volcan Santa Maria, Guatemala, October (Schaus and Barnes). Paratypes, 14 specimens of both sexes from the same locality and collectors; two males, Jalapa, Mexico (Schaus collection); one male, Orizaba, Mexico (Schaus collection); seven specimens, Purulha, Sitio, and Juan Vinas, Costa Rica (Schaus and Barnes); one female, Trinidad, West Indies (A. Busck); a single specimen from Castro, Parana, Brazil, seems indistinguishable, but is not made a paratype on account of the geographical separation. It would seem that all these forms should be referable to *tersella*; but in that the measurement which Zeller gives of one wing is three-quarters the expanse of the specimens before me, and also he figures the two lines of fore wing as meeting on the inner margin, which is not so in the species here described.

SCOPARIA EXTINGUA Dyar

Scoparia extingua DYAR, Ins. Ins. Mens., vol. 9, p. 67, 1921.

This species follows here, though the markings are so faint that the obliquity of the inner line can be made out in certain specimens only. The species *denigata* Dyar and *rigidalis* Barnes and McDunnough, previously referred to, are allied.

SCOPARIA ALBIPUNCTATA Druce

Scoparia albipunctata DRUCE, Biol. Cent.-Am., Lep. Het., vol. 2, p. 563, 1899.

Described from Volcan Irazu, Costa Rica. I have a single female, slightly larger than Druce's measurement, Volcan Santa Maria, Guatemala, July (Schaus and Barnes). A very obscurely marked species, but the inner line of fore wing is erect and dentate, not oblique.

SCOPARIA TRICOLOR Zeller

Scoparia tricolor ZELLER, Stett. Ent. Zeit., vol. 33, p. 478, 1872.

Described from Colombia, and I have no material that I can positively identify with the name. *Scoparia cyclophora* Dyar from Mexico, however, evidently comes very close. This is represented in the collection by one female only. The following is close, but I think not identical:

SCOPARIA MOLLICULELLA, new species

As in *cyclophora*, slightly smaller, grayer, the blotching about as in the named species but lighter, scarcely contrasted. The reddish color inheres only in the reniform, which is composed of a ring open below or of two opposed cusps. This is possibly the male of *cyclophora*, but much more probably a derivative form addicted to high altitudes. Expanse, 14 mm. (*cyclophora* expands 16 mm.).

Type—Male, paratypes, two males, Cat. No. 41348, U.S.N.M.; Popocatepetl Park, Mexico, 8,000 feet, June, 1906 (W Schaus).

SCOPARIA STEREOSTIGMA Dyar

Scoparia stereostigma DYAR, Proc. U. S. Nat. Mus., vol. 54, p. 369, 1918.

Smaller and more compactly shaped than *molliculella* but evidently allied. Six specimens from Jalapa, Mexico, the type locality, are in the collection and four more from Volcan Santa Maria, Guatemala.

SCOPARIA MULTIFACIES, new species

Fore wing light gray, shaded with blackish beyond inner line and terminally, sometimes extensively shaded, rarely with a bronzy reflection; inner line pale, erect or slightly curved or irregular; orbicular and claviform obscure in the dark shade following it; median space generally clear gray; reniform a ringlet or quadrate or blotched, in one specimen covered and surrounded by a reddish shade to the outer line; this pale, notched more or less subcostally, crenulate, rather regular, preceded by a slender dark line, the termen solidly dark except for more or less distinct traces of an angled white subterminal line. Hind wing whitish, solid fuscous about the margin. Expanse, 13 mm.

Type.—Female, Cat. No. 41349, U.S.N.M.; Volcan Santa Maria, Guatemala, July (Schaus and Barnes). Paratypes, eight specimens of both sexes from the same locality and collectors and three specimens from Jalapa, Mexico (Schaus collection).

SCOPARIA INEXOPTATA, new species

A large pale long-winged species. Gray, rather evenly irrorate with black scales; lines pale, the inner curved or slightly oblique, followed by a narrow black line; claviform and orbicular detached beyond it, both dashes; reniform a double ellipse, quadrately joined; outer line sharply indented subcostally, with narrow black inner edge; terminal space indistinctly dark shaded, the pale subterminal line indistinctly X-shaped with the outer line. Hind wing pale sordid. Expanse, 16–22 mm.

Type.—Male, paratypes, three males, Cat. No. 41350, U.S.N.M.; Popocatepetl Park, Mexico, 8,000–10,000 feet and 9,500–11,500 feet. June, 1906 (W. Schaus).

SCOPARIA YCARDA, new species

Gray, rather dark, pulverulent in appearance in slightly flown specimens. Lines white, narrow, the outer roundedly excurved mesially; inner followed by a moderate black shade from which the linear claviform and orbicular project; reniform quadrate, often dotted or obscure, in the type brownish filled; terminal area dark with only traces of a pale sinuate subterminal line. Expanse, 10–13 mm.

Type.—Female, Cat. No. 41349, U.S.N.M.; Volcan Santa Maria, Guatemala, November (Schaus and Barnes). Paratypes, 11 specimens of both sexes from the same locality and collectors, and one female, Orizaba, Mexico, July, 1913 (R. Müller).

SCOPARIA BISCUTELLA Zeller

Scoparia biscutella ZELLER, Stett. Ent. Zeit., vol. 33, p. 474, 1872.

Scoparia albifrons DRUCE, Biol. Cent.-Am., Lep. Het., vol. 2, p. 278, 1895.

The name *albifrons* was introduced by Druce (1895) for what he thought a different species from *biscutella*, but his figure indicates the same form. Described from Columbia, specimens are before me from various localities in Costa Rica and Guatemala.

SCOPARIA ANAGANTIS Dyar

Scoparia anagantis DYAR, Proc. U. S. Nat. Mus., vol. 54, p. 370, 1918.

Of the same pattern as *biscutella* but a larger species. The unique type is a female, the markings being reduced and open.

SCOPARIA CRASSIUSCULA, new species

Pattern and color of *biscutella*, but smaller, the wings shorter and broader, much less elongate. The markings seem condensed and approximate in comparison with the named species, which is probably due to the wing-shape. Expanse, 13 mm.

Type.—Male, Cat. No. 41352, U.S.N.M.; Castro, Paraná, Brazil (Schaus collection). Paratypes, male and female with the same data. A fragment of a specimen, front wings only, St. Jean, Maroni River, French Guiana (W. Schaus) is apparently the same.

SCOPARIA IMPARILIS, new species

Wings rather elongated, pointed at apices. Pale violaceous gray; a broad black streak from base of fore wing on submedian fold to origin of vein 2; a black blotch for orbicular and a larger one for reniform, joined by a black line in lower part of cell and followed faintly by reddish; terminal space limited by a faint dark line, olivaceous shaded and with irregular black streaks; terminal black dots small, connected by a shade; fringe pale; ordinary lines wanting. Hind wing pale gray, the fringe white. Expanse, 17 mm.

Type, Male, Cat. No. 41380, U.S.N.M.; Villa Baleda, Porto Santo, Jamaica (T. D. A. Cockerell).

SCOPARIA VINASALIS, new species

Markings of *crassiuscula* but still smaller and more delicate. The marks are more smooth and even, the terminal space contrastingly dark, with a pale blotch centrally, not giving the X-mark appearance. The ground color has a tint of lilaceous, especially in the female. Expanse, 10 mm.

Type.—Male. Paratypes, two males and a female, No. 41353, U. S. N. M.; Juan Vinas, Costa Rica, January, May, and November (Schaus and Barnes).

SCOPARIA EXCURSALIS, new species

Small and delicate, the wings rather narrow and elongate. Fore wing light gray with violaceous tint, some black shading at the base; inner line pale, indistinct, but indicated by the black outer shading, angled outward mesially; ordinary spots lost except the reniform, which is dark, diffused and stained with reddish centrally; outer line scarcely indicated, forming with the subterminal line an indistinct X mark in the lightly darkened terminal area. Expanse, 11 mm.

Type.—Male. Paratype, male, No. 41354, U.S.N.M.; Juan Vinas, Costa Rica, the paratype marked February (Schaus and Barnes).

SCOPARIA ULMAYA, new species

Small, brown, with slight bronzy reflection; lines pale, the inner slightly oblique, the outer with loop-like central excurve; a round black spot for claviform; a thick rectangular black dash for reniform, the wing between the marks rather heavily filled in with brown; two black terminal patches; fringe pale, checkered with black. Expanse, 10 mm.

Type.—Male, No. 41355, U.S.N.M.; Guadeloupe, West Indies, July, 1905 (A. Busck).

SCOPARIA LONGIPENNIS Zeller

Scoparia longipennis ZELLER, Stett. Ent. Zeit., vol. 33, p. 479, 1872.

Described from Colombia. Specimens are before me from Mount Poas, Costa Rica, and Las Vigas, Mexico.

Other described South American species not otherwise here referred to are as follows:

Scoparia jonesalis Dyar, Bermuda.

Scoparia anadonta Dyar, Mexico.

Scoparia atricuprea Hampson, Jamaica, Colombia.

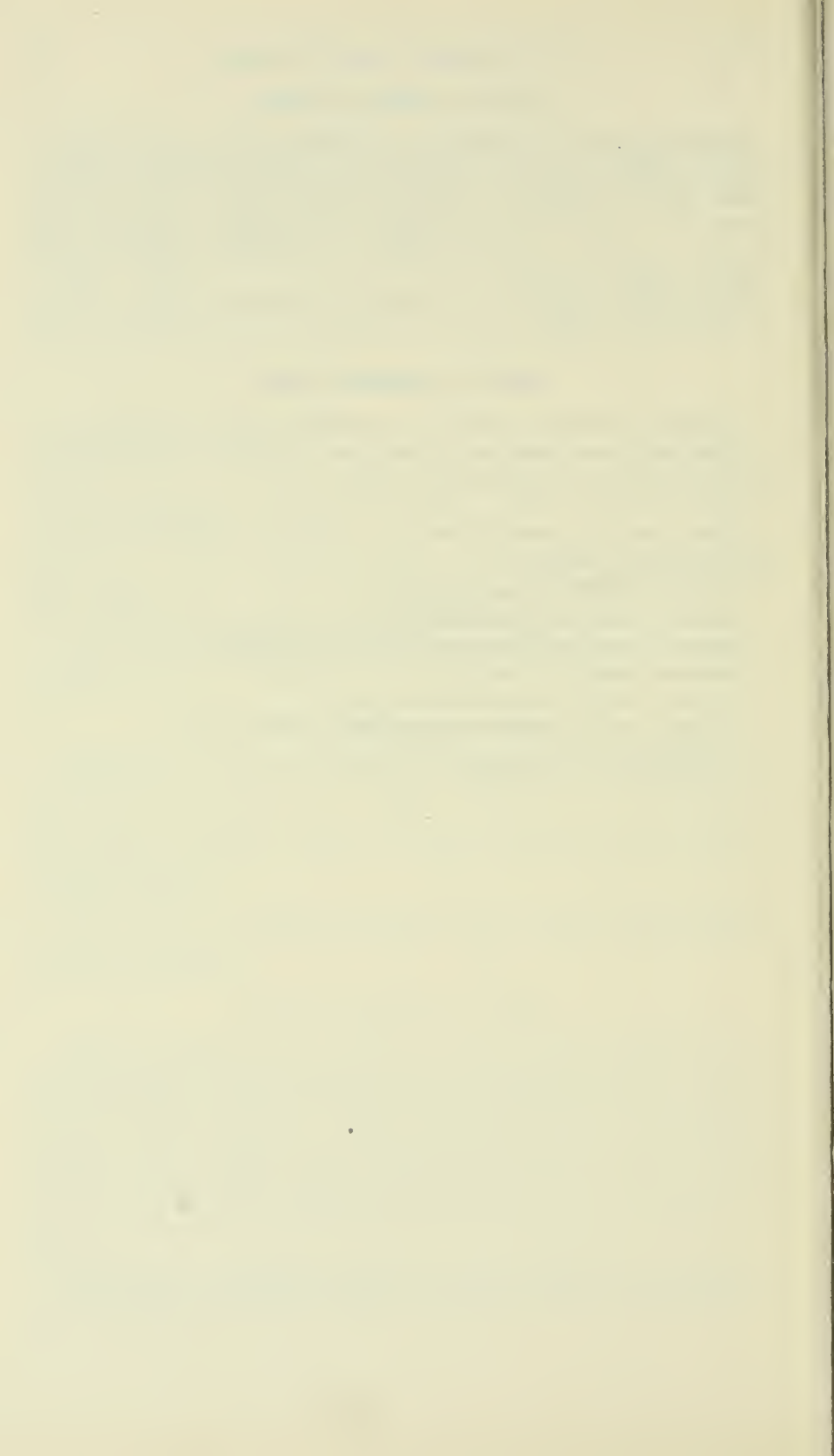
Scoparia ceramica Warren, Peru.

Scoparia strigigramma Hampson, Peru.

Scoparia ragonoti Butler, Peru, Chili, Juan Fernandez.

Scoparia chordactis Meyrick, Patagonia.





A NEW SALAMANDER FROM SOUTHERN CALIFORNIA

By EMMETT REID DUNN

In my "Salamanders of the Family Plethodontidae" (1926) I was inclined to regard the record of *Ensatina croceater* from "a district about 75 miles southeast of San Diego"¹ which Cope reported "from near San Diego"² as really referring to *eschscholtzii*, because the latter occurs in the Coast Range and in the San Bernardino, thus intervening between the other records of *croceater* and the above-mentioned one. The most southern record of *croceater* aside from the Lower California one was Fort Tejon, Kern County, which is the type locality, but which may well be vague and erroneous, at least as to exactness. All other records were from the Sierras. Therefore in the absence of actual specimens the divided range of *croceater* led me to question the identification of the Lower California specimen.

Recently L. M. Klauber³ has figured one specimen and given records of five salamanders from San Diego County and two from Riverside County which he considers *croceater* and which thus tend to confirm the record of Cope and Lockington.

He also suggests that my allocation of their specimen to the San Pedro Martir Mountains is incorrect, as they lie 140 miles southeast of San Diego, and says Laguna Hanson, 77 miles southeast, is a more probable station.

Klauber's figure impressed me as being different from any *croceater* I had seen (12 from the Sierra Nevada). Two specimens in the United States National Museum (Nos. 75229-30) from near Banning, Riverside County, confirm this impression, and make it apparent that we have to do with a third Californian species of *Ensatina*, found in the San Jacinto, Laguna, and Cuyamaca Mountains, in Riverside and San Diego Counties, and also probably in Lower California. This makes *eschscholtzii* in California restricted to the northern Sierras, the Coast Range, and the San Bernardino, and *croceater* to the southern Sierras.

¹ Lockington, 1880, Amer. Nat., p. 295.

² Cope, 1889, Bull. U. S. Nat. Mus. 34, p. 151.

³ 1927, Bull. Zool. Soc. San Diego, no. 3, p. 2, fig. 1.

Mr. Klauber has kindly presented the National Museum with a beautiful specimen from Descanso which may well serve as the type of

ENSATINA KLAUBERI, new species

Type.—Cat. No. 75337, U.S.N.M. collected by Joe Carter, April 1, 1928, female adult.

Type locality.—Descanso, San Diego County, Calif.

Range.—San Jacinto, Laguna, and Cuyamaca Mountains, in Riverside and San Diego Counties, and northern Lower California.

Diagnosis.—An *Ensatina* with few large light blotches or crossbands on body and tail.

Description of type.—Costal grooves 12–13; toes overlapping when appressed; head width about 5 in distance from snout to vent; head length 2.7 in length of body; head oval; eye longer than its distance from nostril; eye shorter than its distance from tip of snout; upper jaw straight as seen from side; angle of jaw back of hind angle of eye; both eyelids under a fold of skin behind; a groove from eye to gular fold; a groove from this down behind angle of jaw; fingers 3, 2, 4, 1 in order of length, a tubercle at base of all except first; two tubercles on palm; toes 4, 3, 2, 5, 1 in order of length, a tubercle at the base of the three middle ones; tail constricted at base, tapering, swollen dorsally, longer than body; vomerine teeth 26 in series, beginning far outside outer edge of naris, curving in and back to meet its fellow, separated from parasphenoids by twice width of naris; latter in two patches beginning at middle of eye socket; black above, light brownish gray below; elbow and upper arm, knee and thigh, band from angle of jaw over occiput, including upper eyelid, two and one-half irregular bands on body, and four on the tail, light yellow, tip of tail likewise light yellow.

Total length 127 mm., head 19.5, body 53.5, tail 54.

Variation.—A male, Cat. No. 75229, U.S.N.M., received from Dr. Dwight W. Pierce and collected by Arthur Gilman at Mill Canyon, near Banning, has a slightly swollen snout; head length $3\frac{1}{2}$ in length of body; tail as long as head and body; two irregular bars on body, and irregular light spotting on tail; 21 vomerine teeth; total length 130 mm., head 15, body 50, tail 65. A female, same data (Cat. No. 75230), has the occipital band broken into two spots; a single crossbar on body, and two large spots on left side and one on right; a crossbar in the anal region; four complete and two incomplete bars on tail; total length 95 mm., head 14, body 43, tail 38. Klauber writes that the specimen he figured from near Descanso was 140 mm. long. He describes the color as "black, fading on the sides to dusky purplish gray. The irregular series of dorsal blotches (one on the head engaging the eyelids, four on the body, four on the tail)

are orange rufous; under surfaces transparent light vinaceous lilac. The legs are of the same color as the dorsal blotches except the extremities, which are similar to the under surfaces."

Remarks.—The localities for this animal are:

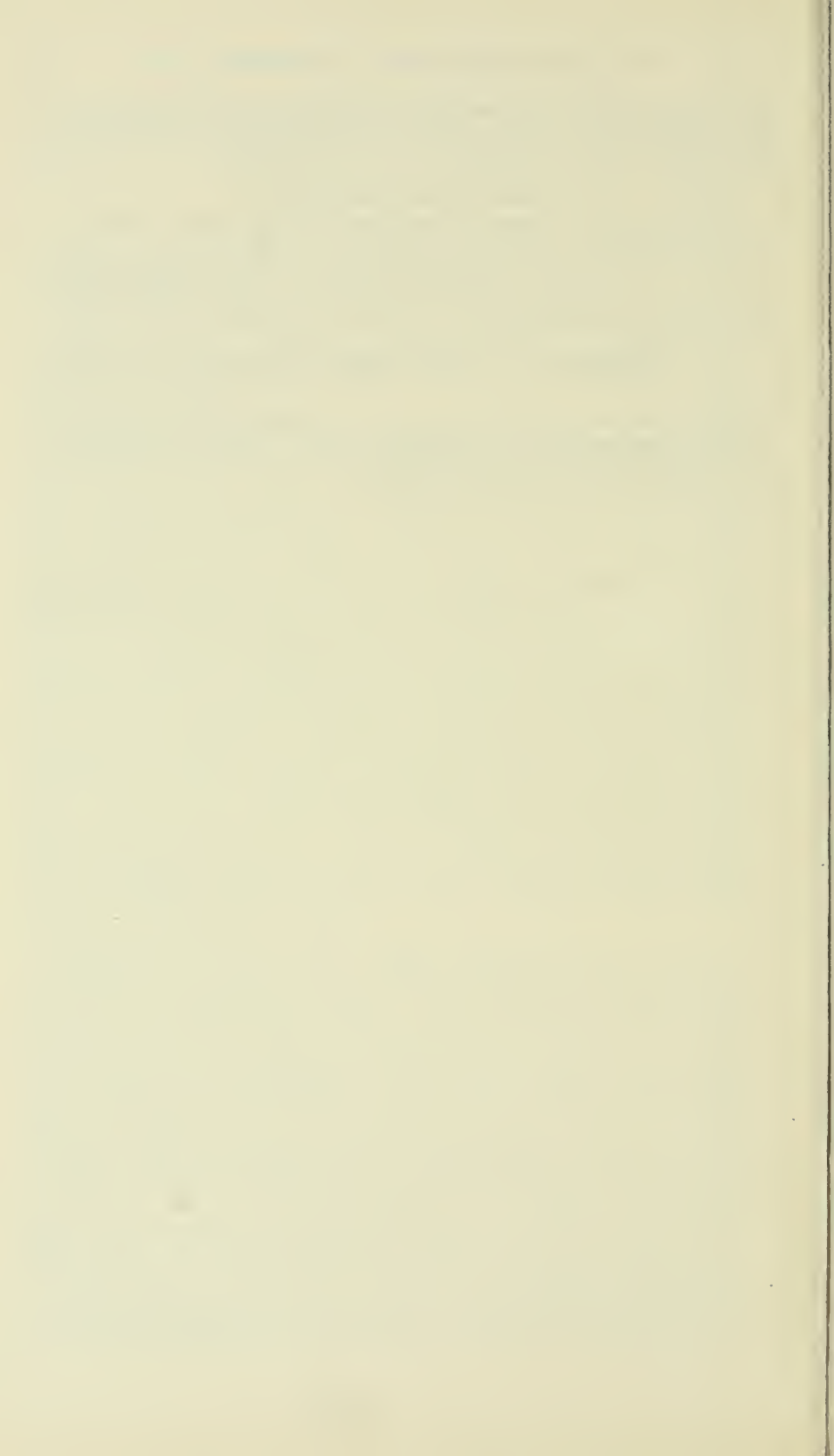
Riverside County: San Jacinto Mountains, 5,500 feet. Mill Canyon, near Banning. (Cat. No. 75229-30, U.S.N.M.)

San Diego County: Cuyamaca Mountains; Rose Mine, Laguna Mountains; 3 miles northeast of Descanso; Descanso (Cat. No. 75337, U. S. N. M.).

Lower California: "75 miles southeast of San Diego [Laguna Hanson ?].

This is the most distinct species in the genus. Absence of dorsal markings distinguishes *E. eschscholtzii*; *E. croceator* and *platensis* have very small and irregular spotting.





THE GUMS OF THE PORPOISE PHOCENOIDES DALLI (TRUE)

By GERRIT S. MILLER, JR.

Curator, Division of Mammals, United States National Museum

The remarkably small size of the teeth in the porpoises of the genus *Phocænoides* is well known. (Pl. 1.) True¹ pointed it out in his original description of *Phocæna dalli*, the first species to be discovered, and Andrews² later made it one of the diagnostic characters upon which he established *Phocænoides* as a genus distinct from *Phocæna*. Specimens collected in Alaska by Ernest P. Walker have brought to light the unexpected fact that the gums of *P. dalli* are so modified as to form a set of secondary gum teeth, alternating with and surrounding the true teeth, the extremities of which have come to lie at the bottoms of pits between the bases of the new structures, whose size and hardness is such that they are undoubtedly capable of functioning as efficient grasping organs. (Pls. 2-4.) No such condition has, to my knowledge, been described in any cetacean; and there is no known member of the order other than the two species of *Phocænoides* (the Alaskan *P. dalli* and the Japanese *P. truei*) in which the character of the dentition is such as to suggest that it might exist. Whether or not the structures which I am about to describe occur in *Phocænoides truei* as well as in the Alaskan species is a question which can not now be answered. Andrews says of the type (p. 41): "The teeth of this specimen are exceedingly small and in life project but slightly above the surrounding membrane." This remark seems hardly applicable to pit-ensconced teeth like those of *P. dalli*; but the gums of the animal may have been injured in skinning out the skull.

The skulls with gums in place obtained by Mr. Walker are Nos. 243599 and 251757, U.S.N.M., taken, respectively, at Wrangell on September 7, 1922, and at Sullivan Island, Lynn Canal, in November, 1926. There is also a nearly full term fetus (No. 251759) from

¹ Proc. U. S. Nat. Mus., vol. 8, p. 96, May 20, 1885.

² Bull. Amer. Mus. Nat. Hist., vol. 30, p. 31, May 16, 1911.

Sullivan Island, but unfortunately its head is injured and the mouth is not well preserved. The skulls, after partial fleshing, were treated with salt. They arrived at Washington in a slightly moist condition, and the gums, when soaked in fresh water and subsequently placed in alcohol, appear to have retained much if not all of their original structure.

The general appearance of the gums as viewed from the outer side is shown in Plate 2 (natural size). It will be seen that, along the entire course of the tooth row, except at the front, where some injury has been suffered, the gums stand up as a serrate-topped, raised mass, which, in the uninjured region extending backward from the middle of the row, entirely conceals the teeth. Probably in a fresh specimen with perfect gums no teeth would be visible anywhere in the series.

Photographs of segments containing four teeth are shown, five times natural size, in Plates 3 and 4. The gross structure of the gums and the relations of the true teeth to the new prehensile apparatus may be seen with special clearness in the series of four mandibular teeth represented in Plate 3. In the outer view (*a*) the gum has been injured at one point so that the flat crown of the second tooth from the left is visible at the bottom of the angular cleft between the bases of the first and second complete gum teeth. All the other true teeth are hidden in this view as well as in that from the inner side of the jaw (*b*). In the coronal aspect (*a*) the summits of the four true teeth are seen at the bottoms of their pits, with the four alternating gum teeth occupying the areas between them. In Plate 4 we have a segment of the rostrum including four teeth and extending inward nearly to the median line of the palate. It is shown in palatal aspect (*a*) and vertical section (*b*). The gum teeth are foreshortened and flattened by the camera in the palatal view, but their height is well brought out in the vertical section. It will be noted that the entire surface of the palate is coarsely and irregularly wrinkled, the general direction of the broad ridges and narrow intervening furrows tending to be parallel with the tooth row; also that the profile of these secondary ridges, when viewed in cross section, resembles the corresponding profile of the functional gum teeth. The gum surface as seen on the palate (pl. 4*a*) and on the inner side of the mandible (pl. 3*b*) is noticeably papillose. In cross section under this low magnification the papillæ appear as conical outgrowths from the substance of the ridges.

Microscopical preparations, made by staining and sectioning a piece of one of the gum teeth at the Anatomical Laboratory of the Johns Hopkins Medical School,³ show that the elevations are dermal

³I owe this series of slides to the kindness of Dr. George B. Wislocki.

at base but that each is capped by a conspicuous layer of greatly thickened epidermis. At the base of each elevation may be seen a thickened mass of corium from which arises a group of papillæ (about 0.125 mm. in width) extending upward through the first layer of the epidermis. This layer (about 1.05 mm. in thickness), whose cells contain nuclei which tend to be highly refractive, appears to be the *stratum germinativum*. It is followed by a second layer (also about 1 mm. in thickness) in which the nuclei are dark, seemingly the *stratum granulosum*. At the peripheral surface it is elevated into the papillæ which cover the entire surface of the gums. Each superficial papilla is subtended by a papilla of the corium; and in sections which have been cut at appropriate levels the *stratum granulosum* can be seen to be traversed by a narrow line of crowded nuclei extending from the tip of the corial papilla outward into the substance of the terminal papilla. In some preparations the surface of the terminal papillæ is covered by a thin layer of flattened cells which may represent the *stratum corneum*, but which has, in most instances, apparently been stripped away in course of preparation. The superficial appearance of this outermost layer is shown in the upper left hand portion of Figure *a* on Plate 4. Here it may be seen to cover most of the underlying papillæ completely. Occasionally it is pierced by a minute aperture over the tip of a papilla, and occasionally an entire papilla or a small group is entirely laid bare.

The general conditions which I have just described, both macroscopic and microscopic, seem to be not essentially different from those which Tullberg figured as occurring at early stages of the development of the baleen plates in *Sibbaldus*.⁴ Comparing Tullberg's Plate 4 with my Plate 4 the general resemblance in gross structure is at once evident, allowance being made for the much more highly specialized condition present in *Sibbaldus*. The true teeth in the young baleen whale have disappeared. The gum teeth are compressed along the axis of the jaw; their bases have spread inward to occupy a much greater area of the palate; they have increased in height. The papillæ on the palate have become elongated and filamentous. Otherwise there is no important change. The microscopic structure in *Phocænoides* could be fairly well represented by Tullberg's Plate 5, Figure 23, if the drawing were reduced to about one-third of its present height (the width remaining unaltered), the papillæ were represented as single instead of in pairs, the terminal papillæ were cut off at the level of the lower letter *c*, and a dividing line between the *stratum germinativum* and *stratum granulosum* were indicated.

⁴ Nova Acta Reg. Soc. Sci. Upsal., ser. 3, vol. 11, pl. 4, figs. 19-20, and pl. 5, fig. 23. 1883.

These resemblances are so important that we are probably justified in regarding the gingival and dental structures of *Phocaenoides* as representing anatomical stages closely parallel to those through which the corresponding parts in the toothed ancestors of the Mysticeti must have passed.

EXPLANATION OF PLATES

PLATE 1

(Both figures about $\frac{1}{2}$ natural size)

- a. Teeth of *Phocaena phocaena* from St. George Island, Bearing Sea. No. 218737, U.S.N.M.
- b. Teeth of *Phocaenoides dalli* from Sullivan Island, Lynn Canal, Alaska. No. 251757, U.S.N.M. Gums partly removed.

PLATE 2

(Natural size)

- Lateral view of rostrum and mandible of *Phocaenoides dalli* showing gum teeth. (No. 251758, U.S.N.M., Sullivan Island, Lynn Canal, Alaska)

PLATE 3

(All figures $\times 5$)

Part of mandibular toothrow of *Phocaenoides dalli* with gums in place. (No. 243599, U.S.N.M., Wrangell, Alaska)

- a. Outer aspect.
- b. Inner aspect.
- c. Coronal aspect.

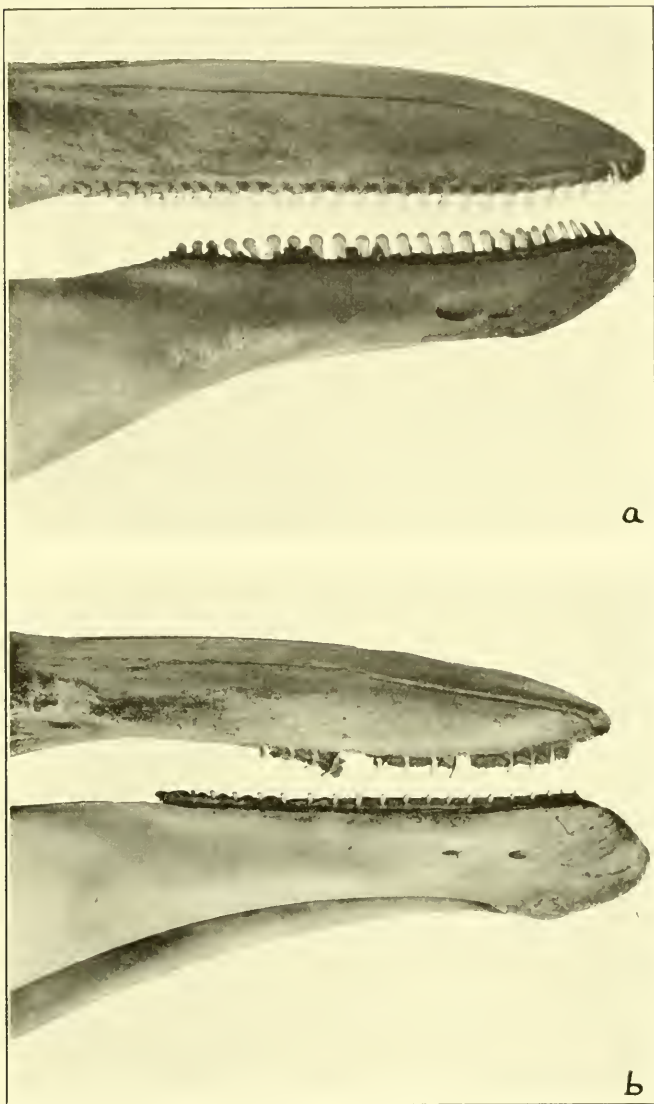
PLATE 4

(Both figures $\times 5$)

Part of rostrum of *Phocaenoides dalli* with gums in place. (No. 243599, U.S.N.M., Wrangell, Alaska)

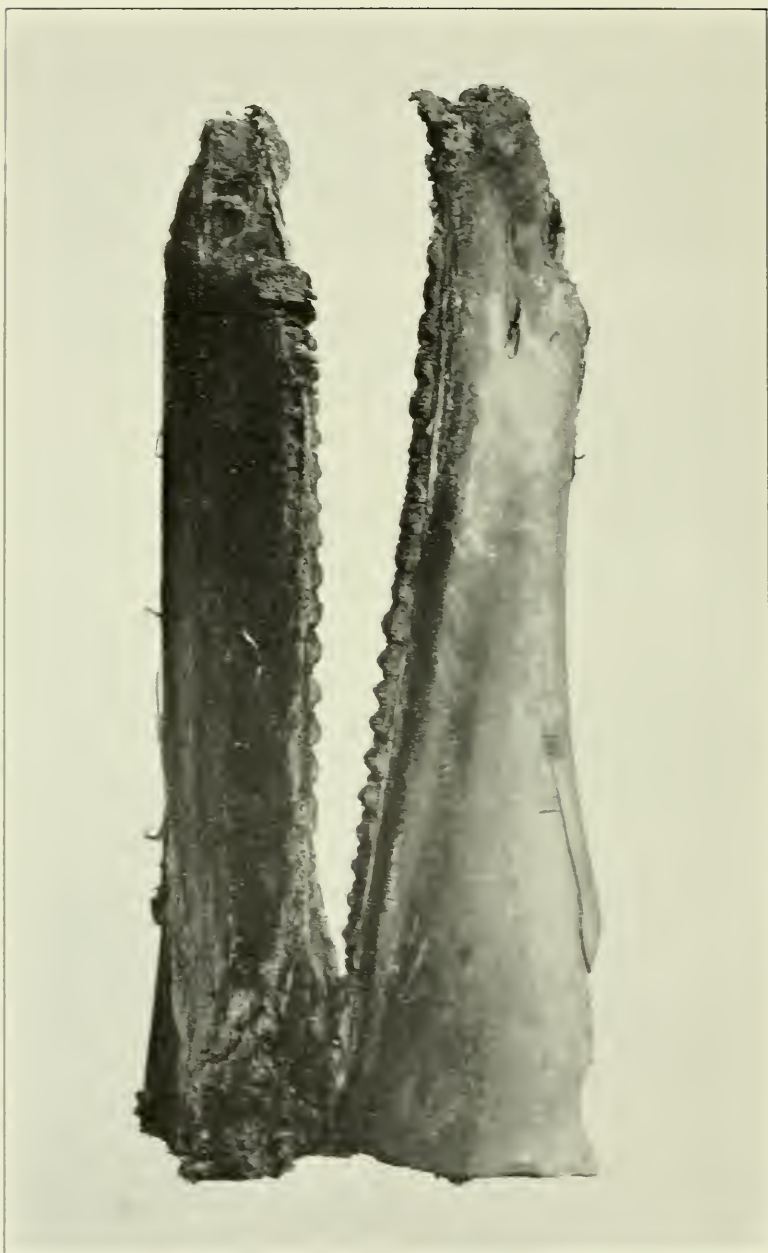
- a. Palatal aspect.
- b. Vertical aspect.





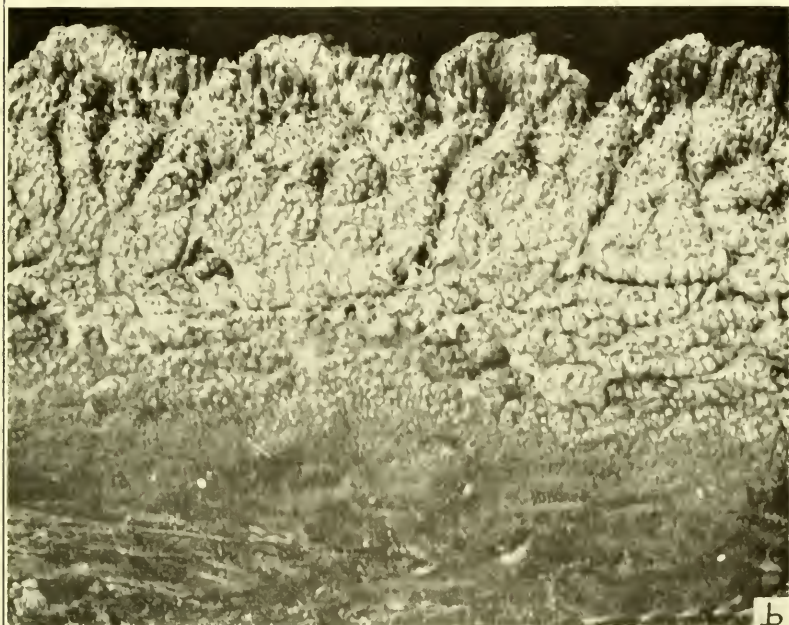
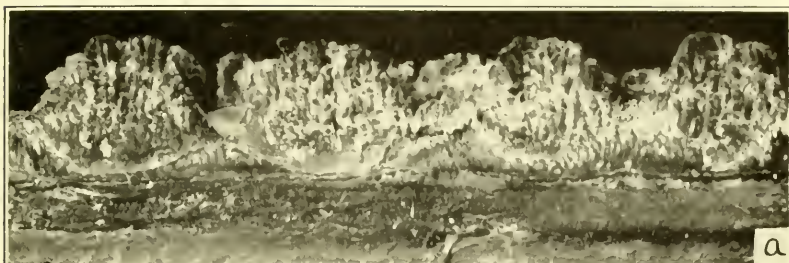
TEETH OF *a* PHOCAENA AND *b* PHOCOENOIDES

FOR EXPLANATION OF PLATE SEE PAGE 4



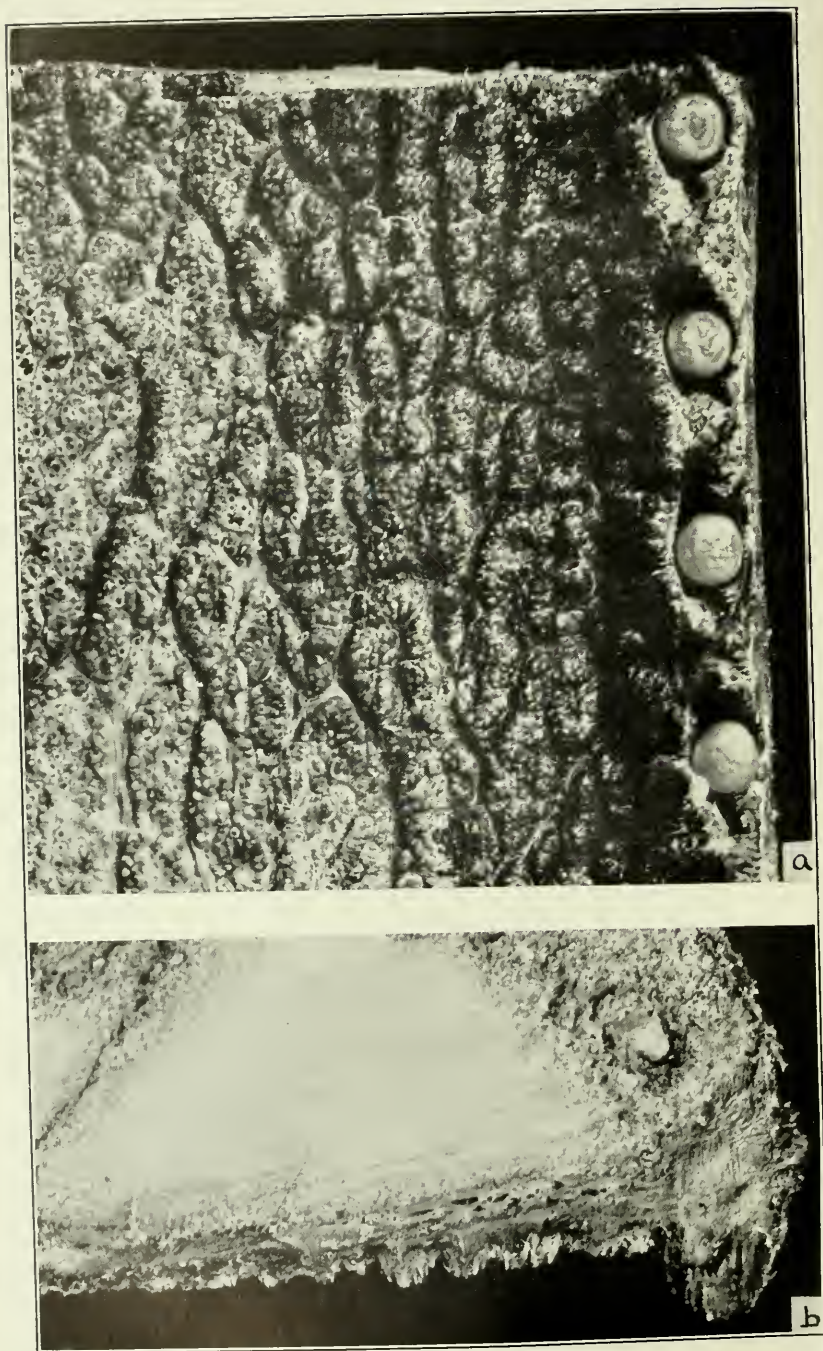
JAWS OF PHOCOENOIDES

FOR EXPLANATION OF PLATE SEE PAGE 4



GUMS OF PHOCOENOIDES, LOWER JAW

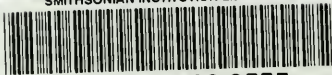
FOR EXPLANATION OF PLATE SEE PAGE 4



GUMS OF PHOCOENOIDES, UPPER JAW

FOR EXPLANATION OF PLATE SEE PAGE 4

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